FEASIBILITY STUDY
PCB REMEDIATION

IBS Site
Peoria, Illinois

November 1992

Ref. No. 4310 (7)

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CONESTOGA-ROVERS & ASSOCIATES

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EXECUTIVE SUMMARY

This Feasibility Study (FS) was conducted to address soil contamination at the IBS Site (Site) in a manner consistent with the National Contingency Plan (NCP). Soils in two different locations at the Site were previously identified as contaminated with polychlorinated biphenyls (PCBs). Previous investigations also identified areas of the Site where soil was contaminated to a lesser extent with dioxins and furans.

A focused Risk Assessment (RA) was prepared based upon the available soils data. The RA concluded that the lifetime cancer risk associated with the exposure potential to Site contaminants falls within the USEPA established target cancer risk range of 1×10^{-6} to 1×10^{-4}. Although the estimated risk fell within the USEPA's acceptable range, remedial alternatives were evaluated since contamination exceeded USEPA cleanup guidance for PCBs.

The FS first evaluated remedial technologies in terms of their effectiveness, implementability and cost. The remedial technologies which passed the initial screening process were used to develop eleven potential remedial alternatives including:

- no action;
- institutional controls;
- concrete cap and deed restrictions;
- excavation, concrete cap and deed restrictions;
- excavation and on-site thermal desorption;

implementability; and cost. A summary of this evaluation is provided in Table ES-1.

Alternative 1, the no action alternative, remained as a viable option since the focused RA indicated that the site cancer risk fell within acceptable limits established by USEPA. However, this alternative would not reduce or contain the Site contamination.

Alternative 2A, a concrete cap with deed restrictions, would effectively contain the contaminated soil and significantly reduce the exposure risk associated with direct contact with the soil. The concrete cap would provide a durable containment system which could be utilized during Site activities and would minimize the disruption of Site operations.

Alternative 2B was developed as a variation of the concrete cap alternative and includes excavation of soils with PCB concentrations between 10 mg/kg and 50 mg/kg and disposal at a solid waste landfill. Those soils with PCB concentrations greater than 50 mg/kg would be contained with a concrete cap. This alternative would achieve similar effectiveness as the concrete cap only alternative, but at a significantly lower capital cost since a much smaller area would require containment.

Alternative 3 involves the excavation and thermal desorption treatment of the contaminated soils which would effectively reduce the Site exposure risk by removing the contaminants from the soil for off-site treatment or disposal. This alternative has the highest estimated cost of the remedial alternatives analyzed in detail. This technology is generally

TABLE ES-1

SUMMARY OF DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

IBS SITE
PEORIA, ILLINOIS

Evaluation Criteria	Alternative 1 No Action	Alternative 2A Concrete Cap and Deed Restrictions	Alternative 2B Excavation, Concrete Cap and Deed Restrictions	Alternative 3 Excavation and On-Site Thermal Desorption	Alternative 4 Excavation and Soil Washing	Alternative 5 Excavation, Soil Screening and Off-Site Landfilling
Process Description	No action.	A concrete cap would be installed over the contaminated areas. Deed restrictions would be placed on the property restricting site use to industrial activities.	Soils with PCBs between 10 mg/kg and 50 mg/kg would be excavated and disposed at a solid waste landfill. A concrete cap would be constructed over soils with PCBs >50 mg/kg. Implement deed restrictions.	Soils with PCB concentrations >10 mg/kg excavated for on-site thermal desorption treatment. Treated soils backfilled on-site.	Soils with PCBs >10 mg/kg excavated for soil washing. Treated soil backfilled on-site. Extracted PCBs removed off-site for further treatment and/or disposal	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg subjected to soil screening. Concentrated soil disposed at off-site TSCA landfill. Soils with PCBs <50 mg/kg disposed at off-site solid waste landfill.
Overall Protection of Human Health and the Environment	No improved protection of human health or the environment.	Effectively contains contaminated soil preventing ingestion, inhalation and dermal contact. Significant reduction in risk.	Effectively removes or contains contaminated soil preventing ingestion, inhalation and dermal contact. Significant reduction in risk.	Effectively removes PCBs from the site, significantly reducing risk.	Effectively removes PCBs from the site, significantly reducing risk.	Effectively removes PCBs from the site, significantly reducing risk.
Compliance with ARARs	Does not provide compliance with location- or chemical-specific ARARs. Not applicable to action-specific ARARs.	Concrete cap provides flood protection. Chemical-specific ARARs would be met through containment. Action-specific ARARs would be met.	Concrete cap provides flood protection. Chemical-specific ARARs would be met through containment. Action-specific ARARs would be met.	Location-, chemical- and action-specific ARARs compliance would be achieved.	Location-, chemical- and action-specific ARARs compliance would be achieved.	Location-, chemical- and action-specific ARARs compliance would be achieved.
Long-Term Effectiveness and Permanence	Would not provide long-term effectiveness or permanence since no measures will be taken to address contamination.	Provides long-term effectiveness and permanence but dependent upon effective maintenance of the cap. Durable, long-lasting concrete cap.	Provides long-term effectiveness and permanence but dependent upon effective maintenance of the cap. Durable, long-lasting concrete cap.	Since PCBs would be removed off-site, significant reduction in risk.	Since PCBs would be removed off-site, significant reduction in risk.	Since PCBs would be removed off-site, significant reduction in risk.
Reduction of Toxicity, Mobility or Volume Through Treatment	Not applicable since no treatment technology would be implemented.	No reduction in toxicity or volume. Reduces mobility by containment.	No reduction in toxicity. Some reduction in volume. mobility by containment.	Significantly reduces toxicity, mobility and volume through thermal desorption treatment.	Significantly reduces toxicity, mobility and volume through treatment.	Significantly reduces mobility through containment. No reduction in toxicity or volume.
Short-Term Effectiveness	Would not provide long-term effectiveness or permanence since no measures will be taken to address contamination.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.
Implementability	Not applicable since no treatment technology would be implemented.	No implementation problems expected.	No implementation problems expected.	Difficulty may be encountered with permitting and community acceptance.	No implementation problems expected.	No implementation problems expected.
Cost	No capital or O&M costs would be incurred since no treatment technology would be implemented.	Capital - $935,000 O&M - $2,000 Present Worth - $953,000	Capital - $592,000 O&M - $2,000 Present Worth - $611,000	Capital - $4,107,000 O&M - none Present Worth - $4,107,000	Capital - $1,962,000 O&M - none Present Worth - $1,962,000	Capital - $1,494,000 O&M - none Present Worth - $1,494,000

- *Results of Sampling at IBS, Inc., Peoria, Illinois. Pursuant to Administrative Order V-W-87-C-034.* Versar, Inc. January 18, 1990.

Based upon the results of the Versar report, CRA was retained to delineate the PCBs in Site soils. As part of this study, samples were collected from the surficial soils and from a soil depth of one to two feet. The results of this study are presented in Section 2.0 of this report.

1.3 NATURE AND EXTENT OF CONTAMINATION

The previous Site investigations included the sampling of and analysis of surficial soils for PCBs, dioxins, copper and zinc. Previous investigations identified two areas within the IBS Site exhibiting PCB contamination. The smaller of these two areas is near the entrance to the Site and is hereby referred to as the "North Area." The North Area was reportedly used to store salvageable electrical transformers. CILCO arranged for the disposal of these transformers. The second and larger area is hereby referred to as the "Southeast Area" and is in the vicinity of two former incinerators where the reclamation of insulated copper wire (generated by CILCO, Caterpillar and others) was performed.

A number of sampling events for various compounds have been performed over the history of the Site. The dioxin sampling was focused in the Southeast Area, near the incinerators. The copper and zinc

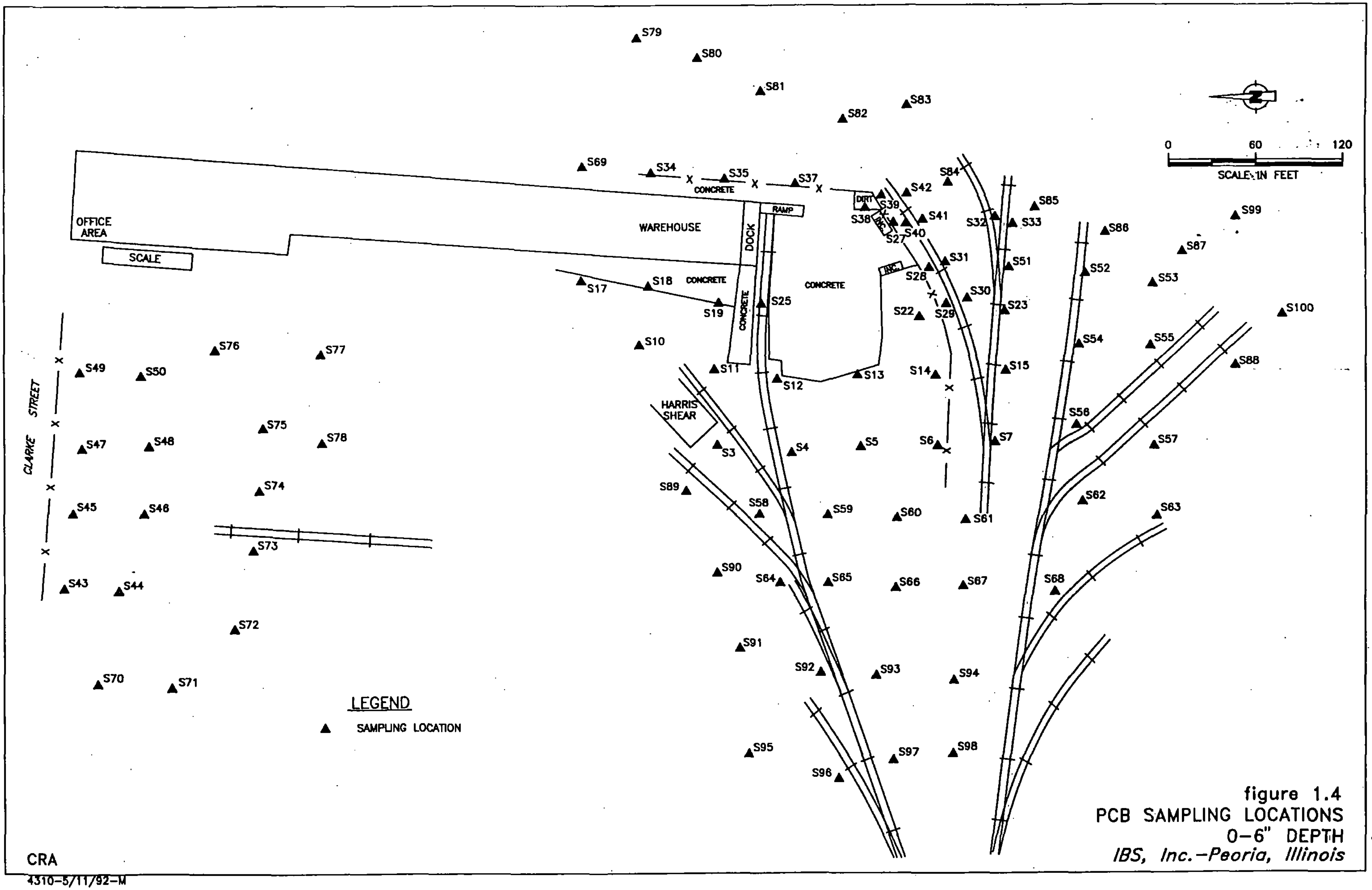


figure 1.4
PCB SAMPLING LOCATIONS
0–6" DEPTH
IBS, Inc.–Peoria, Illinois

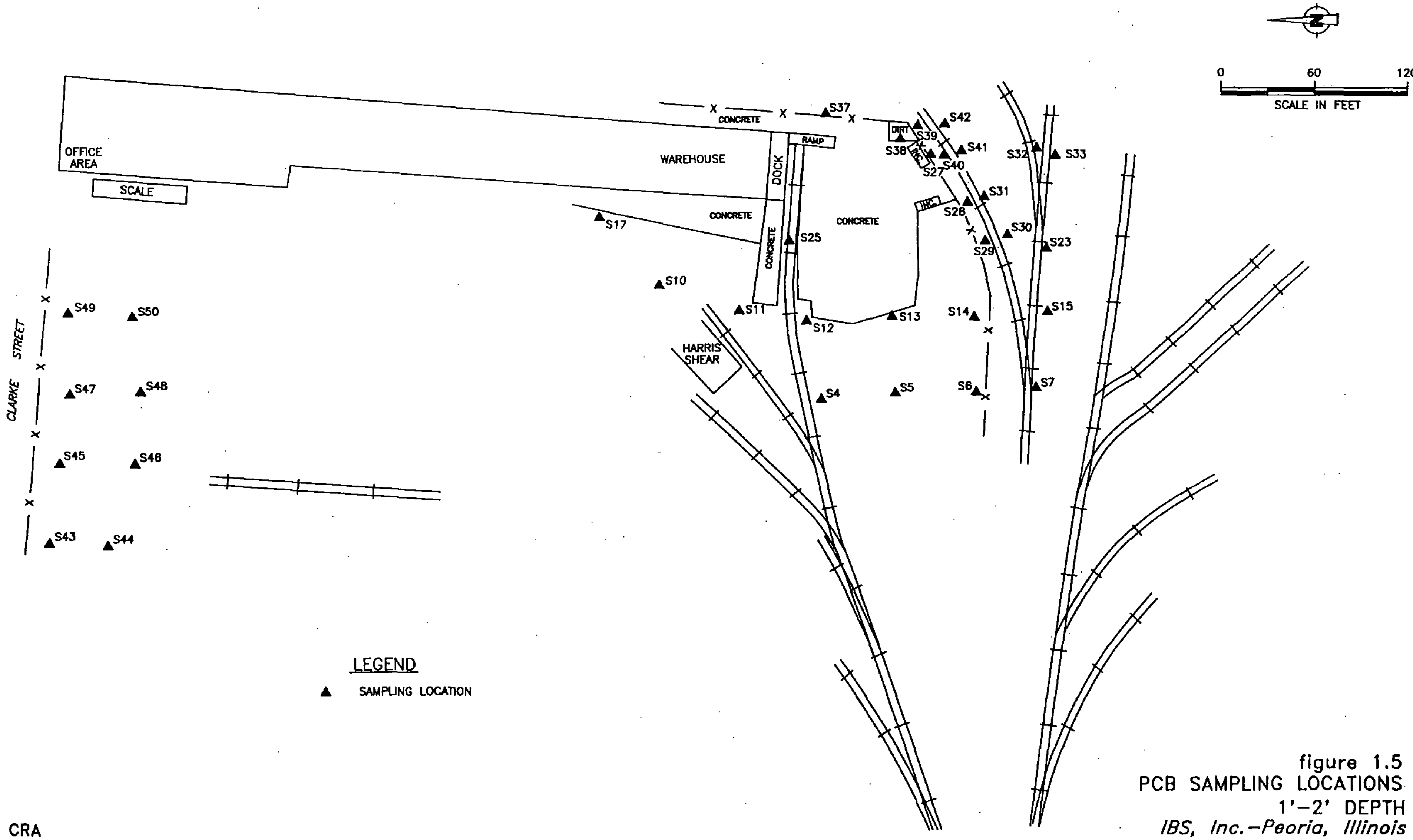


figure 1.5
PCB SAMPLING LOCATIONS
1'–2' DEPTH
IBS, Inc.–Peoria, Illinois

CRA
4310-5/11/92-M

better suited for sites with large amounts of soil to be treated. Much of the cost associated with this alternative is due to the mobilization and demobilization of the treatment equipment, and the costs associated with permitting of the thermal desorption unit. Hence, this alternative is not practical, from a cost and implementation viewpoint.

Alternative 4 involves the excavation, soil washing and off-site landfilling of contaminated soils and would provide effective removal of contaminants from the soil material while reducing the amount of soil requiring off-site disposal. Much of the cost of this alternative is associated with the soil washing process and mobilization/demobilization costs. This technology is not commonly employed for sites with PCB-contaminated soils. Although this alternative effectively reduces the Site contamination, less costly and proven alternatives are available which address contamination with similar effectiveness.

Alternative 5 involves the excavation, soil screening and off-site landfilling of contaminated soils which effectively removes the contaminated soil from the Site for proper disposal, while lowering the associated disposal costs by screening out gravel. This alternative reduces the amount of soil requiring disposal at a TSCA-permitted landfill and reduces the overall cost of the alternative.

Based on an extensive review of remedial alternatives, it is concluded that three alternatives are equally effective, but differ substantially in cost. CRA recommends that Alternative 2B (Excavation, Concrete Cap and Deed Restrictions) be implemented. The second remedial

1.0 INTRODUCTION

This Feasibility Study (FS) presents an evaluation of alternative remedial actions for the IBS, Inc. (IBS) Site, an active metal salvage facility located in Peoria, Illinois. This FS was conducted to address soil contamination at the IBS Site in a manner consistent with the National Contingency Plan (NCP).

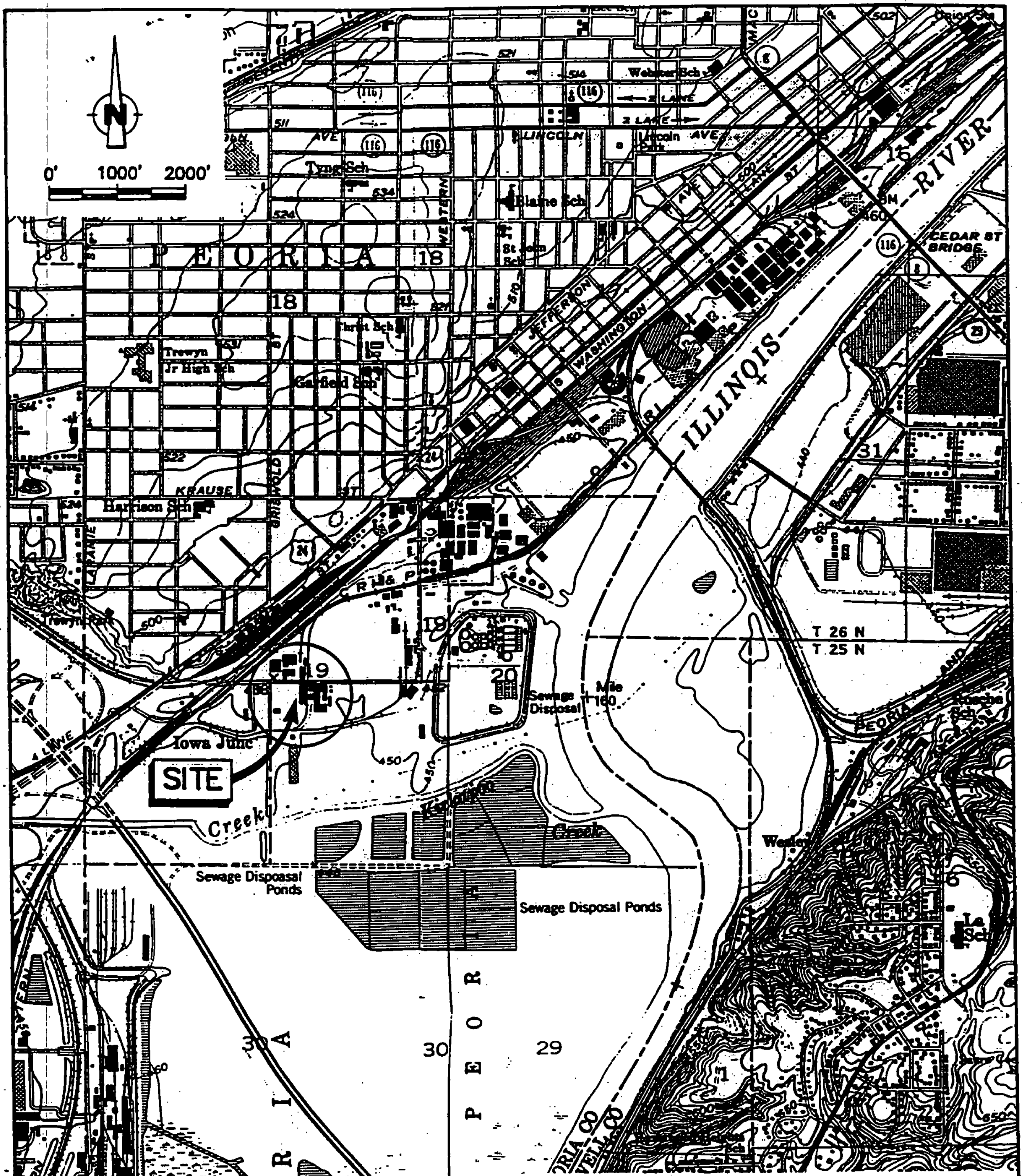
1.1 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this FS is to identify and evaluate remedial alternatives for the remediation of contaminated soils present in the surficial soils at the IBS Site (Site).

This FS has been prepared in accordance with the guidance documents "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*" (USEPA, 1988), "*National Oil and Hazardous Substance Pollution Contingency Plan (NCP)*" (USEPA, 1990) and "*Guidance on Remedial Actions for Superfund Sites with PCB Contamination*" (USEPA, 1990).

This FS report is organized as follows:

- Section 1.0 provides Site background;
- Section 2.0 presents a risk assessment;
- Section 3.0 presents Site-specific ARARs;



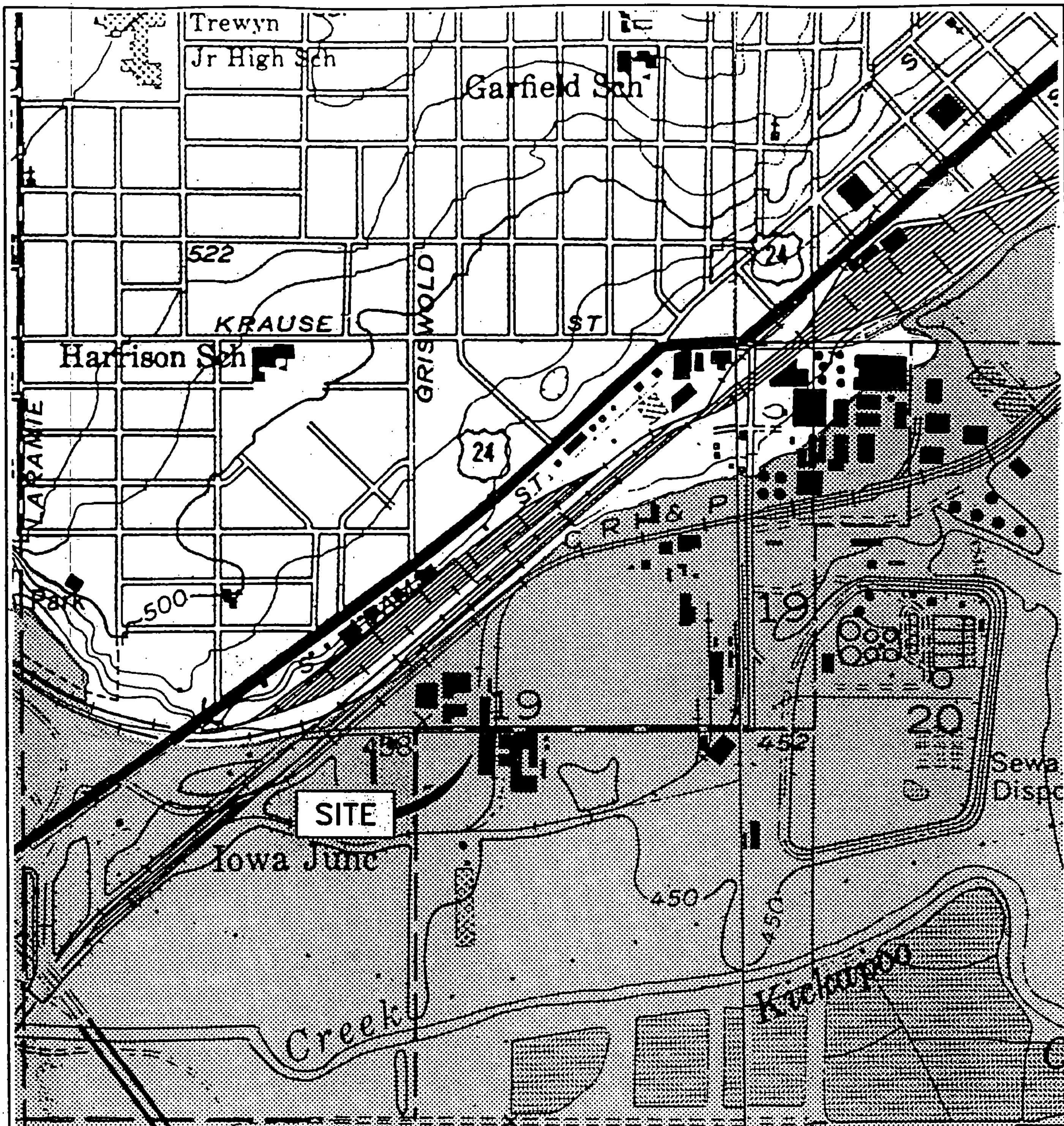
SOURCE: USGS QUADRANGLE MAPS
PEORIA EAST AND PEORIA WEST, ILLINOIS

SITE
ILLINOIS

CRA

figure 1.1
SITE LOCATION
IBS SITE
Peoria, Illinois

4310-2/10/91-1-0



LEGEND

100 YEAR FLOODPLAIN

NOT TO SCALE

figure 1.3
100 YEAR FLOODPLAIN MAP
IBS, Inc.–Peoria, Illinois

CRA

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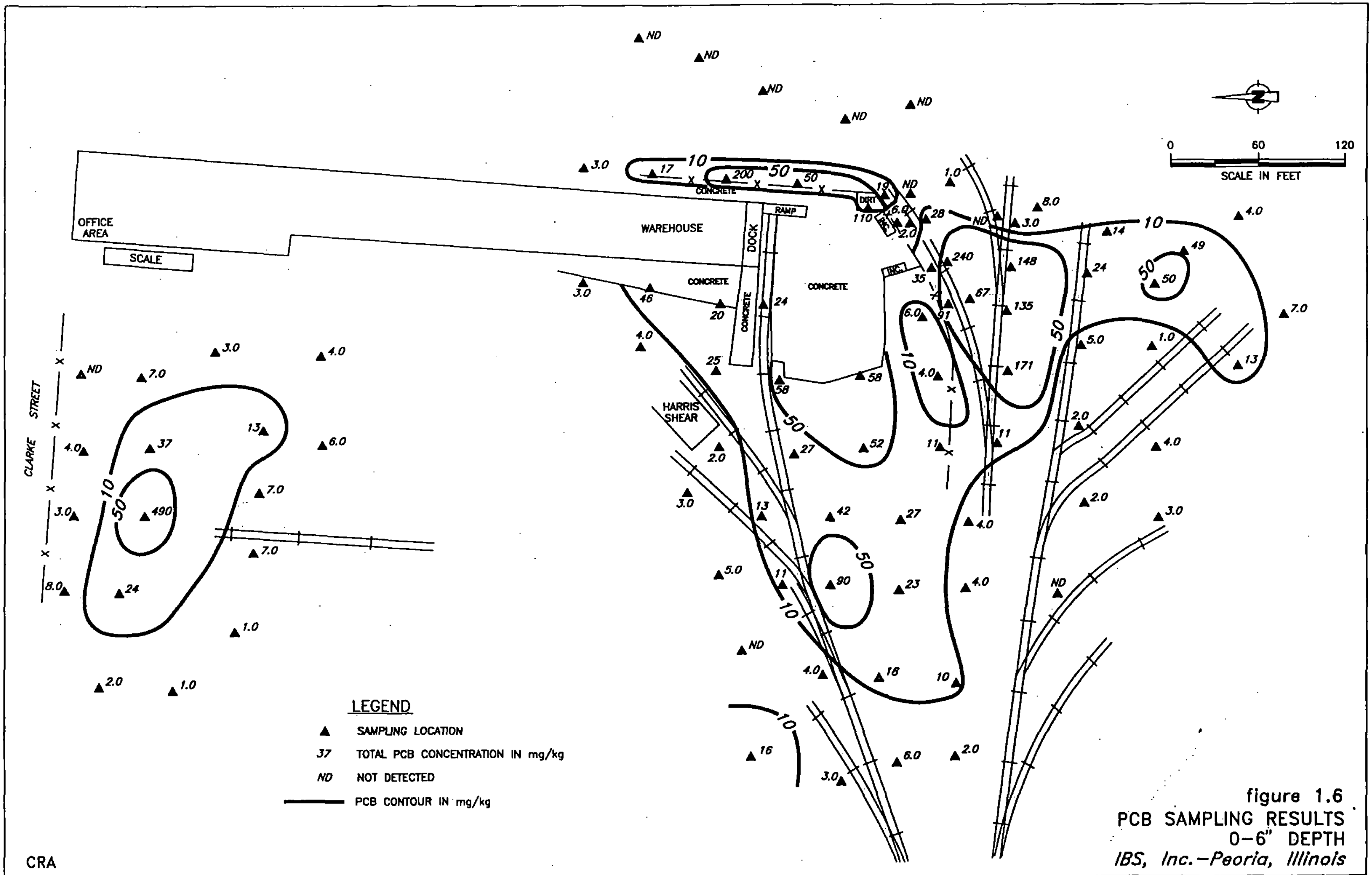

figure 1.6
PCB SAMPLING RESULTS
0–6" DEPTH
IBS, Inc.–Peoria, Illinois

4310-5/11/92-M

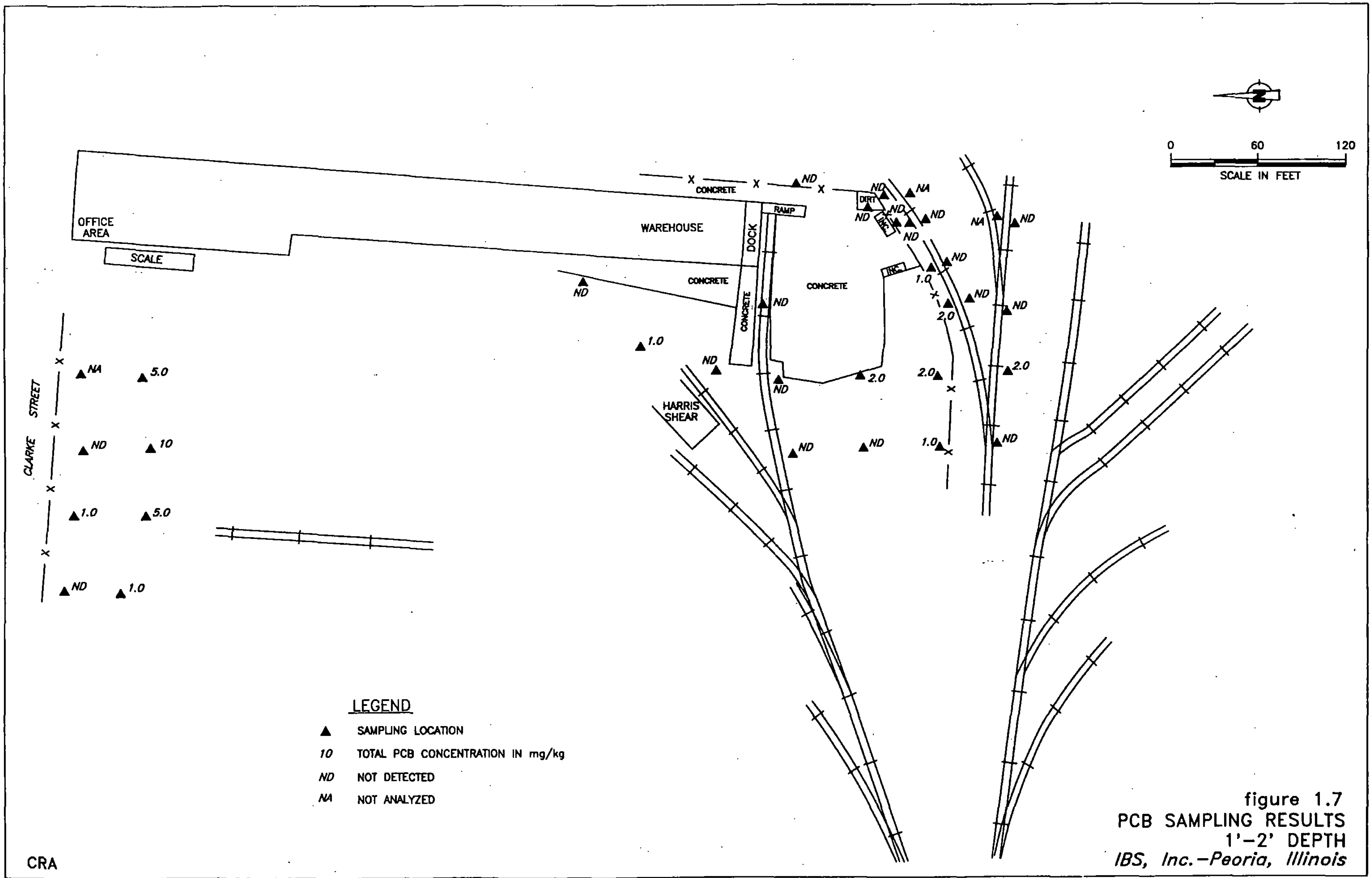

figure 1.7
PCB SAMPLING RESULTS
1'–2' DEPTH
IBS, Inc.–Peoria, Illinois

4310–5/11/92–M

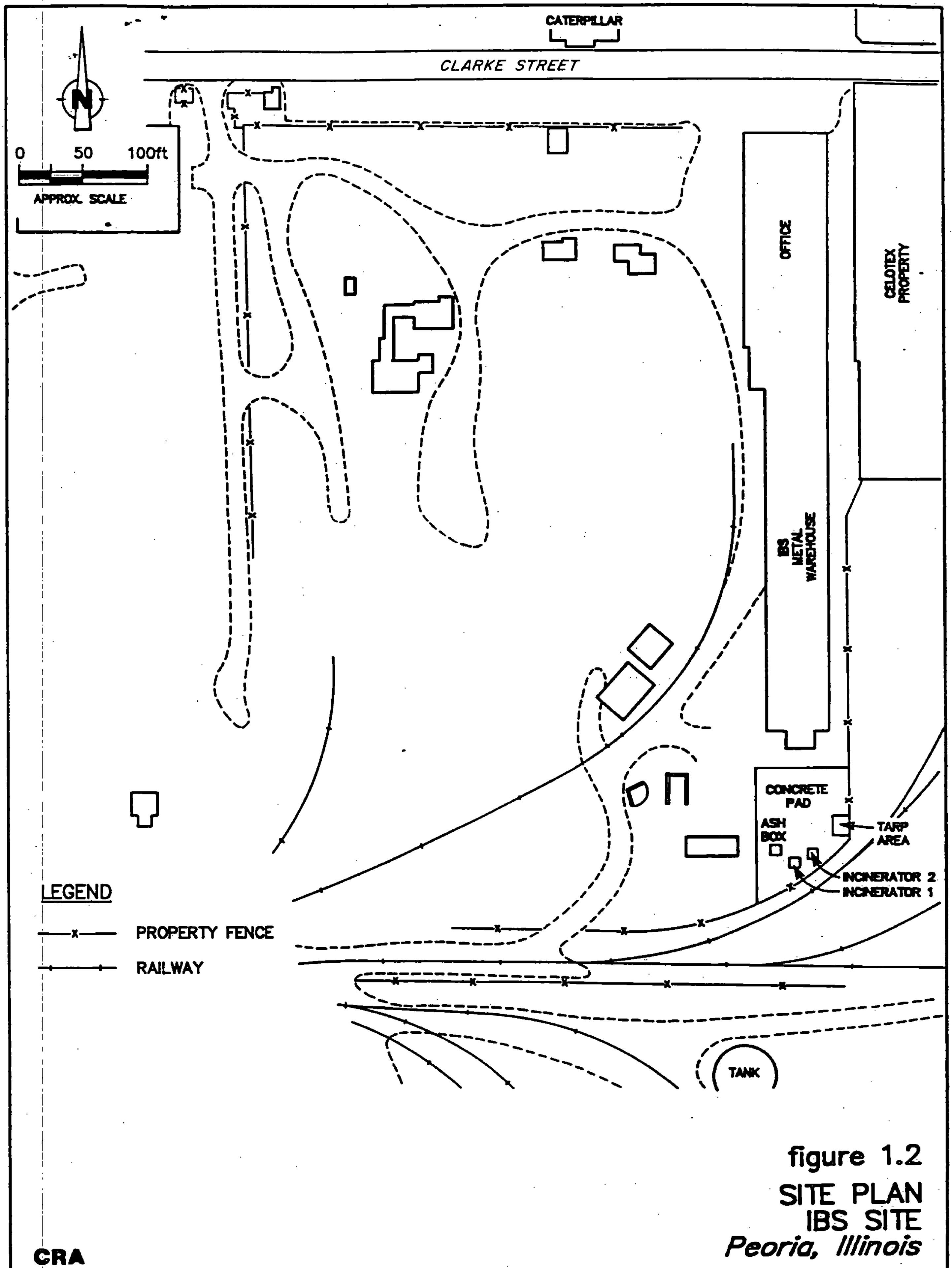

figure 1.2
SITE PLAN
IBS SITE
Peoria, Illinois

4310-6/11/92-M

1.2.2 Site History

IBS, Inc. is a metal salvage facility, primarily involved in salvaging various types of ferrous and non-ferrous metals. Past metal reclamation activities have also included recycling electrical transformers. IBS was also involved in reclaiming copper from insulated wire, performed by incinerating the wire to remove insulating materials. The copper wire reclamation activities were performed in two on-site incinerators located in the southeast portion of the Site. The older of these two incinerators was used for wire reclamation from 1972 to 1981. The newer of the two incinerators was operated from 1975 until 1987, when the Illinois EPA requested that IBS cease the incineration activities.

The bottom ash generated during incineration was shoveled from the incinerators and placed in Gaylord boxes. The incinerated wire was placed on the adjacent concrete pad and rinsed with a high pressure washer. The residual ash rinsed from the wire was allowed to dry and was placed in the Gaylord boxes. The boxed ash was sold for further reclamation of residual copper.

1.2.3 Summary of Previous Investigations and Interim Actions

The IBS Site originally received attention under the U. S. Environmental Protection Agency (USEPA) Tier 4 National Dioxin Study, due to the use of two permitted incinerators for copper wire

Based upon the PCB sampling results generated by CRA and assuming a one-foot depth of soil, the following volumes of contaminated soil are estimated as follows:

PCB Concentration Range (mg/kg)		*Estimated Volume of Soil (C.Y.)*
10 to 25		1,600
25 to 50		500
greater than 50		1,600
	Total	3,700

The estimated soil volumes to be excavated/treated to a specific PCB concentration are listed below. Figures 1.8 through 1.10 graphically depict the respective contaminated soil areas.

PCB Concentration Range (mg/kg)	*Estimated Volume of Soil (C.Y.)*	*Figure Number*
greater than 10	3,700	1.8
greater than 25	2,100	1.9
greater than 50	1,600	1.10

1.5 REMEDIAL OBJECTIVES

The remedial objective for the IBS Site is to implement a remedy which addresses the following:

- The remedy should be protective of human health and the environment;

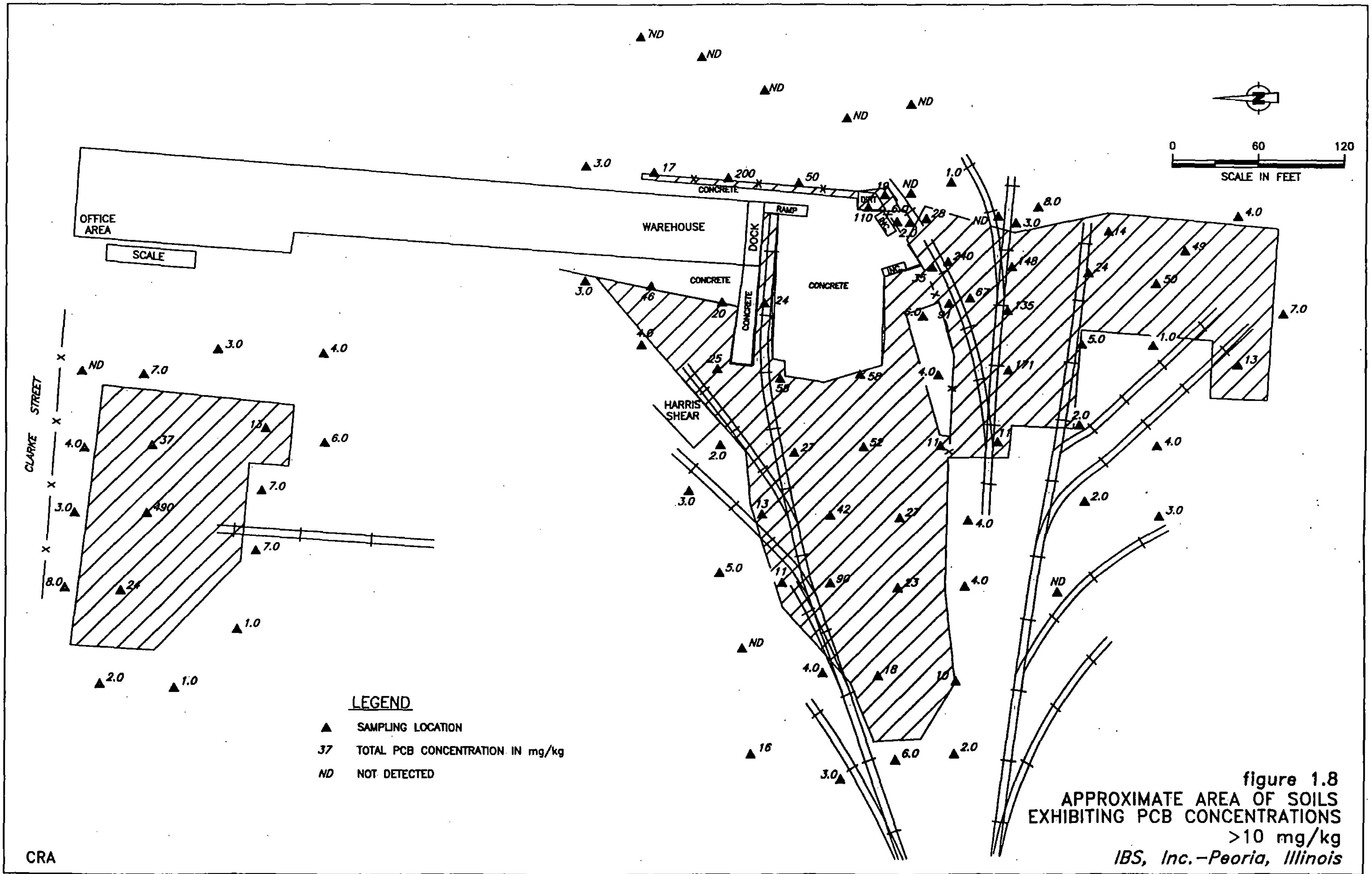

figure 1.8
APPROXIMATE AREA OF SOILS EXHIBITING PCB CONCENTRATIONS >10 mg/kg
IBS, Inc.–Peoria, Illinois

CRA
4310-5/11/92-M

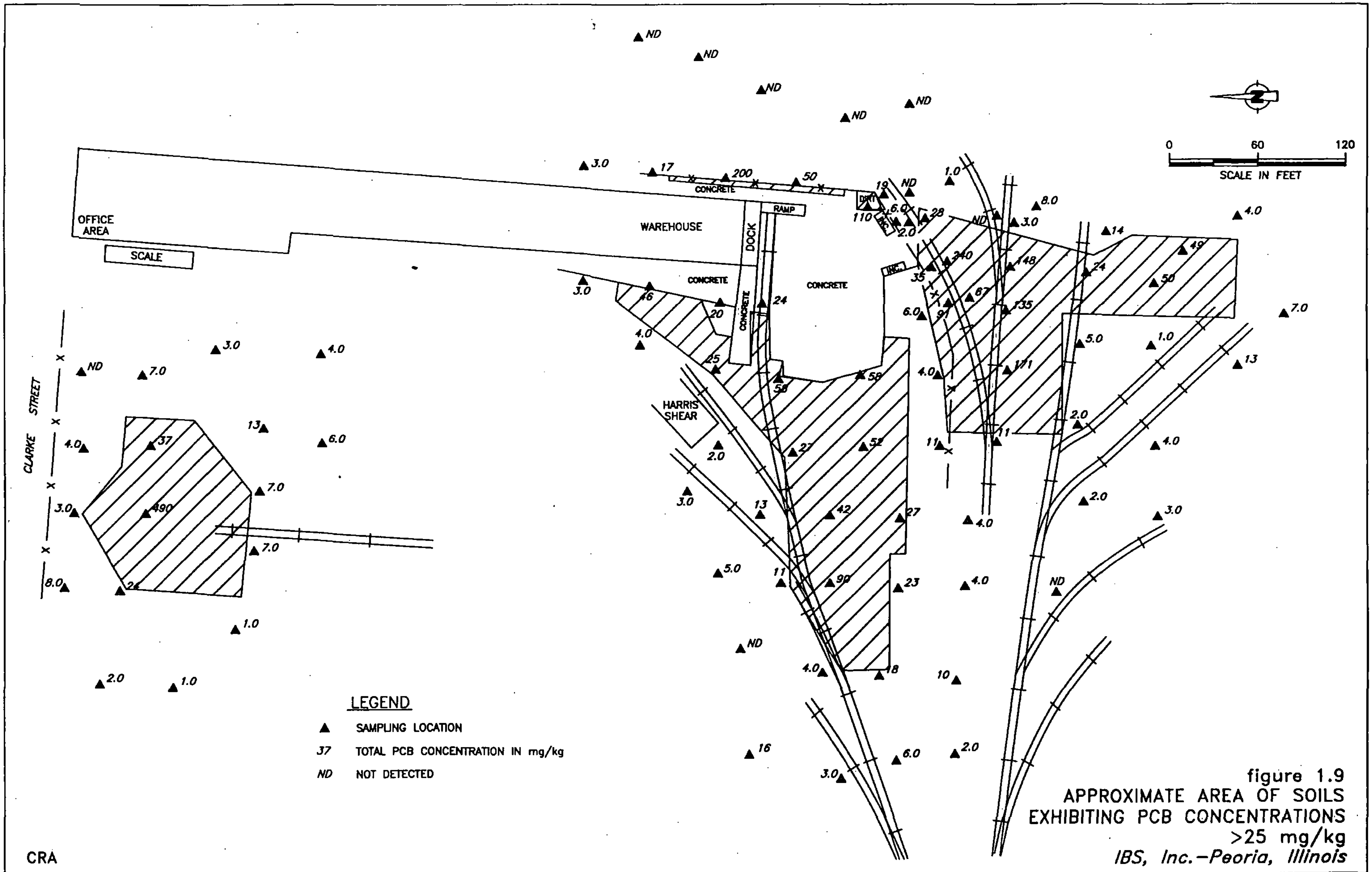

figure 1.9
APPROXIMATE AREA OF SOILS
EXHIBITING PCB CONCENTRATIONS
>25 mg/kg
IBS, Inc.–Peoria, Illinois

4310–5/11/92–M

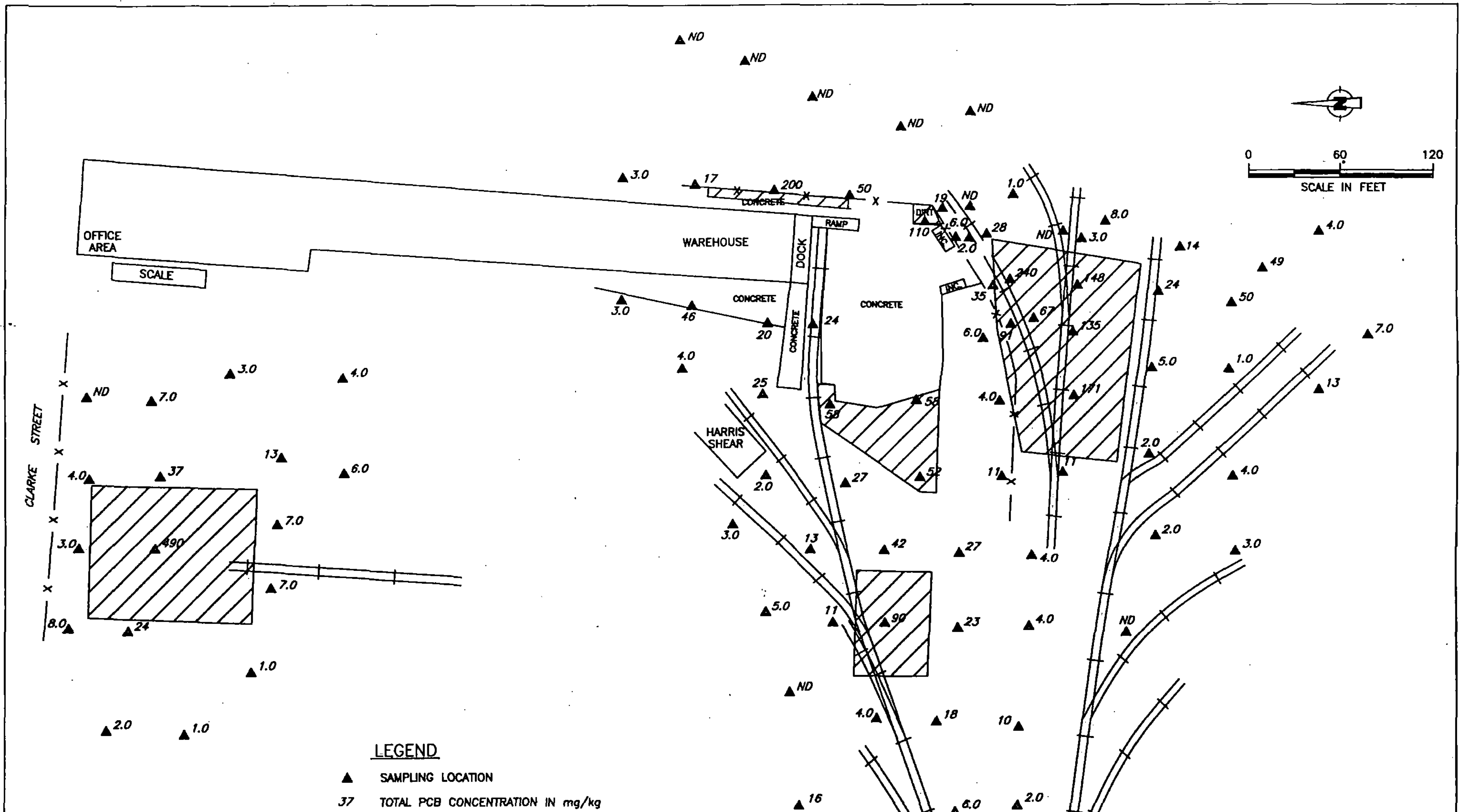

figure 1.10
APPROXIMATE AREA OF SOILS EXHIBITING PCB CONCENTRATIONS >50 mg/kg
IBS, Inc.–Peoria, Illinois

CRA
4310-5/11/92-M

- The remedy should effectively address exposure, reduce contamination or treat contamination;

- The remedy should meet legally ARARs;

- The remedy should be implementable and

- The remedy should be cost-effective.

USEPA Guidance provides specific cleanup levels for PCBs in soil (USEPA 1990). In accordance with this guidance document, the focused risk assessment and Site-specific factors, a remedial goal for PCBs at the IBS Site is to reduce PCB contamination in surface soils to levels in the range of 10 mg/kg to 25 mg/kg.

It should be noted that remedial alternatives were evaluated with consideration of the December 1987 Administrative Order action level for industrial settings for TCDD dioxin equivalence of 5 µg/kg.

It should also be noted that TCDD dioxin equivalence concentrations exceeding the USEPA action level of 5 µg/kg fall within the 50 mg/kg PCB areas. Hence, remedial action alternatives designed to address PCBs will also address dioxin contamination.

Site. Therefore, PCBs are identified to be the primary chemicals of concern on the Site property.

Additionally, historical soil data from samples collected prior to 1989 indicated detectable concentrations of dioxins, copper and zinc. Therefore, dioxin, copper and zinc were also evaluated. For the evaluation of dioxins, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is used as a surrogate or representative chemical. This maintains a very conservative approach since TCDD is suspected to be highly toxic and has been extensively studied.

2.2 DATA EVALUATION AND EXPOSURE POINT CONCENTRATIONS

The Site property was divided into two segments; the North and the Southeast Area. Analytical results for PCBs, dioxins, copper and zinc from surficial soil samples collected from each area were used.

Given the data presented in Table 2.1, the arithmetic mean of all detections reported in each area are used as the exposure point concentrations. Non-detects are not included in the derivation of mean concentrations to simplify the evaluation. The use of average concentrations is regarded as a reasonable and representative estimate of Site-wide chemical levels that could be contacted over time. Table 2.2 presents the exposure point concentrations used in this assessment.

TABLE 2.1

SUMMARY OF ANALYTICAL DATA FOR SURFICIAL SOIL
IBS, INC.
PEORIA, ILLINOIS

Data Source	*CRA Sample ID #*	*Date Sampled*	*TCDD Equivalence (1) (ppb)*	*PCBs (ppm)*	*Copper (ppm)*	*Zinc (ppm)*	*Location*
IBS/CRA Phase I	SS3	11/23/91	NA	2	NA	NA	0 - 6"
	SS4	11/23/91	NA	27	NA	NA	0 - 2"
	SS5	11/23/91	NA	49	NA	NA	0 - 6"
	SS5	11/23/91	NA	52	NA	NA	0 - 6"
	SS6	11/23/91	NA	11	NA	NA	0 - 1.5"
	SS7	11/23/91	NA	11	NA	NA	0 - 6"
	SS10	11/23/91	NA	4	NA	NA	0 - 6"
	SS11	11/23/91	NA	25	NA	NA	0 - 6"
	SS12	11/23/91	NA	58	NA	NA	0 - 2"
	SS13	11/23/91	NA	58	NA	NA	0 - 3"
	SS14	11/23/91	NA	4	NA	NA	0 - 6"
	SS15	11/23/91	NA	171	NA	NA	0 - 6"
	SS17	11/23/91	NA	3	NA	NA	0 - 6"
	SS18	11/23/91	NA	45	NA	NA	0 - 6"
	SS18	11/23/91	NA	46	NA	NA	0 - 6"
	SS19	11/23/91	NA	20	NA	NA	0 - 6"
	SS22	11/23/91	NA	6	NA	NA	0 - 2"
	SS23	11/23/91	NA	135	NA	NA	0 - 6"
	SS25	11/23/91	NA	24	NA	NA	0 - 6"
	SS27	11/23/91	NA	6	NA	NA	0 - 6"
	SS28	11/23/91	NA	35	NA	NA	0 - 6"
	SS28	11/23/91	NA	36	NA	NA	0 - 6"
	SS29	11/23/91	NA	91	NA	NA	0 - 6"
	SS30	11/23/91	NA	67	NA	NA	0 - 6"
	SS31	11/23/91	NA	240	NA	NA	0 - 6"
	SS32	11/23/91	NA	ND	NA	NA	0 - 6"
	SS33	11/23/91	NA	3	NA	NA	0 - 6"
	SS34	11/23/91	NA	17	NA	NA	0 - 6"
	SS35	11/23/91	NA	200	NA	NA	0 - 6"
	SS37	11/23/91	NA	50	NA	NA	0 - 6"
	SS38	11/23/91	NA	110	NA	NA	0 - 6"
	SS38	11/23/91	NA	58	NA	NA	0 - 6"
	SS39	11/23/91	NA	19	NA	NA	0 - 6"
	SS39	11/23/91	NA	19	NA	NA	0 - 6"
	SS40	11/23/91	NA	2	NA	NA	0 - 6"
	SS41	11/23/91	NA	28	NA	NA	0 - 6"
	SS42	11/23/91	NA	ND	NA	NA	0 - 6"
IBS/CRA Phase II	S51	03/14/92	NA	118/148	NA	NA	0 - 6"
	S52	03/14/92	NA	24	NA	NA	0 - 6"
	S53	03/14/92	NA	50	NA	NA	0 - 6"
	S54	03/14/92	NA	5	NA	NA	0 - 1.5"
	S55	03/14/92	NA	1	NA	NA	0 - 6"
	S56	03/14/92	NA	2	NA	NA	0 - 6"
	S57	03/14/92	NA	4	NA	NA	0 - 2.5"
	S58	03/14/92	NA	13	NA	NA	0 - 4"
	S59	03/14/92	NA	42	NA	NA	0 - 4"
	S60	03/14/92	NA	27	NA	NA	0 - 3"
	S61	03/14/92	NA	4/2	NA	NA	0 - 6"

TABLE 2.2

EXPOSURE POINT CONCENTRATIONS
IBS, INC.

Chemical	Average Concentrations (mg/kg) North Area	Average Concentrations (mg/kg) Southeast Area
PCBs (total)	38.6 (1)	33.4 (2)
Dioxins (total) (TCDD equivalents)	NS	0.00595 (3)
Copper	NS	2811 (4)
Zinc	NS	1256 (5)

Notes:

(1) Based on surficial soil data from locations: S43 to S50, S40 to S75 and S76 to S78.

(2) Based on historical data and Phase I, II and III surficial soil data from sampling locations outlined in Table 2.1.

(3) To evaluate the average TCDD equivalents for the Southeast Area of the Site, surficial soil data were used from the following locations: E8, E9, E10, VM1, VM2, VM4, VM5, VS1, VS2, VS3, VS4S, VS4, VS5, VS6, VS7 and VS8.

(4) Based on historical data from sampling locations: VM1, VM2, VM4 and VM5.

NS - Not Sampled.

entitled, *"Risk Assessment Guidance (RAGS) for Superfund"*, Volume I: Human Health Evaluation Manual, EPA/540/1-89/002, December 1989; *"RAGS Supplemental Guidance Standard Default Exposure Factors"*, OSWER Directive 9285.6-03, March 25, 1991; *"Exposure Factors Handbook"*, EPA/600/8-89/043, March 1990; *"Dermal Exposure and Assessment: Principles and Applications"*, EPA/600/8-91/011B, January 1992; and *"Superfund Exposure Assessment Manual"*, EPA/540/1-88/001, April 1988. In some instances where the USEPA documents did not present necessary assumptions or where more appropriate scientific data were not available, professional judgment was applied to develop conservative assumptions which are protective of human health.

"Level 1" exposure is based on assumptions which represent the average or mean value for the assumption and approximate the most probable exposure conditions. The scenario details and assumptions are discussed in the subsequent paragraphs.

2.3.1.1 Carcinogen Assessment

a) Dermal Contact

The equation for calculating chemical intake through dermal absorption from soil is presented below:

$$CDI = \left(\frac{CS * SA * AF * MF * ABS\ (dermal) * CF * EF * ED}{BW * AT}\right) * PTF$$

- the soil-to-skin adherence factor is 1.0 mg/cm^2;
- the matrix factor is 0.15 (%/100);
- worker spends 50 percent of his time outside in affected areas;
- frequency of contact for the industrial worker equals 250 days per year;
- exposure duration for the industrial worker is 10 years;
- dermal absorption of PCBs and TCDD is assumed to be 10 percent;
- dermal absorption of metals is assumed to be 1 percent;
- the individual body weight is 70 kg; and
- averaging time is 25550 days for the carcinogen assessment and 365 days for the non-carcinogenic assessment.

b) Incidental Ingestion

The equation for calculating chemical intake through ingestion of soil is presented below:

$$CDI = \left(\frac{CS * IR * CF * EF * ED * ABS\ (Oral)}{BW * AT}\right) * PTF$$

where:

CS	=	Concentration in Soil (mg/kg)
IR	=	Ingestion Rate (mg/day)
CF	=	Conversion Factor (10^{-6} kg/mg)
ABS	=	Absorption Factor (%/100)
EF	=	Exposure Frequency (days/year)

TABLE 2.3

EXPOSURE SCENARIO : WORKERS - SURFACE SOILS
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS
IBS, INC.

EQUATION : INTAKE (mg/kg-day) = (CS x IR x ABS x CF x EF x EI / BW x AT +

CS x CF x SA x AF x MF x ABS x EF x ED) / BW x AT * PTF

where :

CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor: Part of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	*LEVEL 1*	*REFERENCES*
CS (mg/kg)	MEAN	RAGS (1)
IR (OVER 6 YRS) (mg soil/day)	100	RAGS (1)
SA (OVER 6 YRS) (cm2)	1980	HANDS + 1/2 FOREARMS RAGS (1)
CF (kg/mg)	0.000001	RAGS (1)
EF (days/year)	250	RAGS (1)
ED - (CARCINOGEN) (yrs)	10	RAGS (1)
ED - (NON-CARC.) (yr)	1	RAGS (1)
BW (ADULT & OLDER CHILD) (kg)	70	RAGS (1)
AT - CARCINOGEN (yrs x days/yr)	25550	RAGS (1)
AT - NON-CARC. (yrs x days/yr)	365	RAGS (1)
AF (mg/kg)	1	DEAP (2)
MF	0.15	HAWLEY (3)
ABS ORAL	1	RAGS (1)
DERMAL - PCBs and TCDD	0.10	HAWLEY (3)
METALS	0.01	HAWLEY (3)
PTF	0.50	PROFESSIONAL JUDGEMENT

Notes:

(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) EPA DERMAL EXPOSURE AND ASSESSMENT : PRINCIPLES AND APPLICATION, EPA/600/8-91/011B, JANUARY 1992.
(3) ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL, HAWLEY, J.K.. RISK ANALYSIS, VOL.4 NO.5, 1985.

TABLE 2.5

NORTH AREA
EXPOSURE, RISK AND HAZARD CALCULATIONS
EXPOSURE SCENARIO: WORKERS - SURFACE SOILS
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS
IBS, INC.

	Carcinogen Assessment		Non-Carcinogen Assessment	
Chemical	*Average Daily Intake (mg/kg/d)*	*Upperbound Excess Cancer Risk*	*Annual Average Daily Intake (mg/kg/d)*	*Hazard Quotient CDI/RfD*
	Mean	*Mean*	*Mean*	*Mean*
PCBs	3.50E-06	2.69E-05	2.45E-05	2.45E-01

TABLE 2.7

SOUTHEAST AREA
EXPOSURE, RISK AND HAZARD CALCULATIONS
EXPOSURE SCENARIO: WORKERS - SURFACE SOILS
INCLUDES INGESTION AND DERMAL CONTACT WITH CHEMICALS
IBS, INC.

	Carcinogen Assessment		*Non-Carcinogen Assessment*	
	Average Daily Intake (mg/kg/d)	*Upperbound Excess Cancer Risk*	*Annual Average Daily Intake (mg/kg/d)*	*Hazard Quotient CDI/RfD*
Chemical	*Mean*	*Mean*	*Mean*	*Mean*
PCBs	3.03E-06	2.33E-05	2.12E-05	2.12E-01
Dioxins - TCDD Equivalent	5.39E-10	8.09E-05	3.78E-09	NV
Copper	2.55E-04	NV	1.78E-03	4.82E-02
Zinc	1.14E-04	NV	7.97E-04	3.98E-03

Total Lifetime Cancer Risks: 1.04E-04 *Hazard Index:* 2.64E-01

NV = No Value

Tables 2.8 and 2.9 present a summary of pertinent environmental fate constants and chemical properties for the various PCB Aroclors.

Due to the hydrophobic nature of PCBs, their solubility in water is limited. Therefore, the majority of the PCBs are readily adsorbed to solid particles (i.e. soil). Increased organic carbon content of the soil increases the adsorption tendency and capacity.

As reflected by the K_{oc} values presented in Table 2.8, PCBs are immobile compounds. The K_{oc} reflects the tendency of the specific compound to be adsorbed by soil and sediment. The K_{oc} is directly related to the organic carbon content and the amount of fines in the geologic materials, and is inversely related to the solubility of the specific compound in water. Therefore, when the K_{oc} is large, the compounds migrate slowly. The high K_{oc}s for PCBs indicate that PCBs are readily absorbed by organic carbon and fines in sediment/soils. Additionally, PCBs are not readily soluble in water and, as such, are relatively immobile in the environment.

PCBs are classified as a probable human carcinogen (designated as a B2 carcinogen by USEPA) with sufficient evidence of carcinogenicity in animal studies. Evaluating the health effects of PCBs is difficult since they are mixtures and each mixture behaves differently kinetically, and therefore exerts different health effects quantitatively. The individual congeners that contribute significantly to the carcinogenicity of the mixtures have not been identified with certainty. Other congeners may

TABLE 2.9

PHYSICAL AND CHEMICAL PROPERTIES OF AROCLORS
IBS, INC.

Aroclor	*Density (at 20°C) (g/cm³)*	*Viscosity (Saybolt Univ. sec) at 89.9°C*	*Percent Chlorine (%)*	*Flash Point (°C)*	*Fire Point (°C)*	*Pour Point (°C)*	*Distillation Range (°C)*	*Vaporization Rate (g/cm²/h) x 10⁶ at 250°C*	*Dielectric Const. at 20°C*	*Dielectric Const. at 100°C*	*Solubility in Water at 25°C (µg/L)*	*CAS Registry No[a]*
1016	1.37		41	170	ntb[b]		323-356				15,000[c]	12674-11-2
1221	1.18	30-31	21	141-150	176	1	275-320	1,740			1,450[c]	11104-28-2
1232	1.26	31-32	32	152-154	238	-35	270-325	874	5.7	4.6	420[c]	11141-16-5
1242	1.38	34-35	42	176-180	ntb	-19	325-366	338	5.8	4.9	240	53469-21-9
1248	1.44	36-36	48	193-196	ntb	-7	340-375	152	5.6	4.6	52	12672-29-6
1254	1.54	44-58	54	ntb	ntb	10	365-390	53	5.0	4.3	12	11097-69-1
1260	1.62	72-78	60	ntb	ntb	31	385-420	13	4.3	3.7	3	11096-82-5
1262	1.64	86-100	62	ntb	ntb	35-38	390-425	9				37324-23-5
1268	1.81		68	ntb	ntb		435-450		2.5			11100-14-4
1270	1.95		70	ntb	ntb		450-460					

a The registry number for "Aroclor" (number unspecified) is 12767-79-2.
b ntb = none to boiling.
c USEPA/600/G-85/002a - A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater - Part 1. Brinkman and DeKok, 1980. Elsevier Biomedical Press BV.

Table 2.8 presents a summary of pertinent environmental fate constants for TCDD.

As reflected by the extremely low water solubility and significantly high K_{oc}, TCDD (and presumably other dioxins) has a high affinity for soils and would likely remain on or near the surface soils. Biodegradation of dioxins is minimal, with half-lives in soils ranging from 1 year to greater than 10 years (USEPA 1985).

TCDD is classified as a probable human carcinogen (designated as a B2 carcinogen by USEPA) with sufficient evidence of carcinogenicity in animal studies. Toxicity of a dioxin varies with the position and the number of chlorines attached to the aromatic rings. Generally, the toxicity increases with increased chlorine substitution. Chlorine atoms at the 2, 3, and 7 positions are particularly toxic and TCDD, which has chlorine atoms at the 2, 3, 7 and 8 positions is considered the most toxic of the dioxins.

TCDD exhibits a wide range of responses, even at low doses, in many species including man. Additionally, the mechanisms leading to the response are not known in detail. Thus, evaluating the toxicity potential of 210 structurally-related dioxins becomes an extremely difficult task.

USEPA uses the toxicity equivalency factor (TEF) method as an interim procedure for assessing the risks associated with exposures to complex mixtures of chlorinated dibenzo-p-dioxins. In the absence of an

2.4.4 Zinc

Zinc is an element commonly found in the earth's crust. Zinc is widely used particularly in electroplating, smelting and ore processing, alloys, rubber and paints.

The environmental fate of zinc in soil is dependent upon several factors such as pH, redox potential and organic matter content of the soil. Generally, increased pH (>7) and decreased soil salinity favor adsorption of zinc to soil materials (USPHS 1989).

Zinc is classified as a non-carcinogen by USEPA based on inadequate evidence of carcinogenicity in humans and animals. Zinc is also an essential nutrient in humans and animals. The 1986 Recommended Dietary Allowances estimate that a daily dietary intake of 1050 milligrams of zinc per day (15 mg/kg-day) by adults is safe and adequate.

2.5 RISK CHARACTERIZATION

The risk associated with exposures to chemicals of concern can be quantified by the dose-response relationships for non-carcinogenic and carcinogenic effects.

Aroclor 1016 of 0.0001 mg/kg-day (SRC 1987). However, the general applicability of this draft RfD to other PCB Aroclors is unknown. For this RA, the RfD for PCB Aroclor 1016 is used in the evaluation.

For non-carcinogenic effects, the hazard indices (HI) are calculated according to the following general formula:

$$HI = \frac{CDI}{RfD}$$

where:

HI = Hazard Index

CDI = Chronic Daily Intake (mg/kg-day)

RfD = Reference Dose (mg/kg-day)

If the Hazard quotient is less than 1.0 (a level of concern), action is generally not warranted. A hazard index of 1.0 or greater is considered a level of concern and requires additional evaluation.

2.5.1 Carcinogen Assessment for Industrial Worker - Surface Soils

Upon review of Tables 2.3 through 2.7, exposure to average concentration of reported levels in surface soils via incidental ingestion and dermal contact resulted in estimated lifetime cancer risks of 2.7×10^{-5} and 1×10^{-4} for the North and Southeast Areas of the Site,

2.6 CONCLUSIONS

Based on the above assessment, it is concluded that the lifetime cancer risks associated with potential exposures to chemicals of concern reported at the Site falls within the target cancer risk range of 1×10^{-6} to 1×10^{-4}, as established by USEPA. The estimated Site risk falls within USEPA's acceptable range. However, remedial alternatives were evaluated since PCB concentrations exceeded USEPA cleanup guidance for PCBs (USEPA 1990).

TABLE 3.1

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Location-Specific ARARs

Treatment, Storage and Disposal (TSD) facilities within a 100-year floodplain must be designed, constructed, operated and maintained to avoid washout (40 CFR 264.18(b))

TSD facilities must be constructed in such a manner as to minimize the erosion and off-site transport of Site soils (IEPA/WPC/87-012)

Chemical-Specific ARARs

Requirements for PCB Spill Clean-Up (40 CFR 761 Subpart G)

EPA Standards for Management of Specific Hazardous Waste and Facilities (40 CFR 266)

National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)

Action-Specific ARARs

EPA Regulations for Identifying Hazardous Waste (40 CFR 261)

EPA Regulations for Hazardous Waste Generators (40 CFR 262)

Hazardous waste generation, storage and off-site disposal (40 CFR 262.12), (40 CFR 262.20), (40 CFR 262.34)

PCB generation, storage and off-site disposal (40 CFR 761.60), (40 CFR 761 Subparts C and K)

Specifications and requirements for containers used for storage of hazardous wastes (35 IAC 703.201), (35 IAC Subpart I)

Tank storage of hazardous wastes (40 CFR 264 Subpart J)

Container storage of hazardous wastes (40 CFR 264 Subpart I)

Container storage of PCBs (40 CFR 761.65)

Excavation of contaminated soils (40 CFR 268 Subpart D)

4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section presents a wide range of remedial technologies available for remediation of the contaminated soil at the IBS Site. Each technology is screened to identify promising technologies which are collectively used to assemble remedial alternatives evaluated later in this FS report. Three criteria are used to initially evaluate these technologies as follows:

- **Effectiveness** is evaluated in terms of the ability of the remedial technology to achieve the remedial objective by reducing contaminant exposure, toxicity, mobility or volume;

- **Implementability** considers the difficulties in implementing the technology in terms of the construction methods and logistics, including the ability to obtain relevant permits or licenses; and

- **Cost** considers both the capital and operation and maintenance (O&M) costs. The costs of the screened technologies are evaluated relative to each other and are ranked as either high, moderate or low.

The results of this initial identification and screening of technologies is summarized on Table 4.1.

TABLE 4.1

INITIAL IDENTIFICATION AND SCREENING OF TECHNOLOGIES

IBS SITE
PEORIA, ILLINOIS

General Response Action	Remedial Technology	Process Option	Process Description	Effectiveness	Implementability	Cost	Screening Comments	Retained for Development of Remedial Alternatives
No Action	Not Applicable	None	No action.	No reduction in risk.	No action required.	None.	Required by NCP to be carried through the entire technology analysis process.	Yes
Institutional Controls	Access Restrictions	Fencing	Restrict access to contaminated area(s) by installing perimeter fencing.	Reduction in exposure risk. Restricts site use. No reduction in contamination.	Implementable. Much of site is already fenced.	Low capital and O&M costs.	Restricts site use. No reduction in contamination.	Yes
		Deed Restrictions	Restrict current and future use of property within the contaminated areas.	Reduction in exposure risk. Restricts site use. No reduction in contamination.	Implementable through legal and administrative actions.	Low capital costs. No O&M costs.	Restricts site use. No reduction in contamination.	Yes
Containment	Capping	Soil Cap	Ten-inch layer of soil is placed over the contaminated areas.	Reduces exposure to the contaminants. No reduction in contamination.	May require relocation of railroad tracks. Limits site use in capped areas. Flood protection required.	Low capital and O&M costs.	Restricts site use. No reduction in contamination.	No
		Asphalt Cap	An asphalt layer placed above a gravel layer would be constructed over the contaminated areas.	Reduces exposure to the contaminants. and reduces infiltration. No reduction in contamination.	May require relocation of railroad tracks. Limits site use in capped areas. Flood protection required.	Low capital and O&M costs.	Restricts site use. No reduction in contamination.	No
		Concrete Cap	A concrete cap would be installed over the contaminated areas.	Reduces exposure to the contaminants. and reduces infiltration. No reduction in contamination.	May require relocation of railroad tracks. Limits site use in capped areas. Flood protection required.	Moderate capital costs. Low O&M costs.	Difficulty may be encountered in the area of the railroad tracks.	Yes
		Multi-Layer Cap	A multi-layer cap would be installed over the contaminated soil areas.	Reduces exposure to the contaminants. and reduces infiltration. No reduction in contamination.	May require relocation of railroad tracks. Limits site use in capped areas. Flood protection required.	Moderate capital costs. Low O&M costs.	Difficulty may be encountered in the area of the railroad tracks. Technology is designed to reduce leachability which is not applicable to this site.	No
	Vertical Barrier	Slurry Walls	A low permeability, vertical wall is constructed into the soil surrounding the contaminated areas.	Not applicable to contaminated surficial soils. Designed to contain contaminated groundwater.	Some difficulty would be encountered in the areas near the railroad tracks and buildings	High capital costs. Low O&M costs.	Not applicable for surface contamination.	No
Treatment	Bioremediation	In-Situ Bioremediation	Various microbes, nutrients, and oxygen are injected into the soil to promote contaminant degradation.	Uncertain effectiveness for bioremediation of PCBs in soil.	Implementable.	Moderate capital and O&M costs.	Restricts site use. Uncertain effectiveness.	No
		Slurry Phase Bioremediation	Contaminated soil is placed in a reactor vessel with various microbes and nutrients to promote contaminant degradation.	Uncertain effectiveness for bioremediation of PCBs in soil.	Implementable.	High capital and moderate O&M costs.	Uncertain effectiveness.	No
		Landfarming	Contaminated soil is placed on a lined bed for landfarming. Various microbes, nutrients, or other additives are tilled into the soil to promote contaminant degradation.	Uncertain effectiveness for bioremediation of PCBs in soil.	Implementable. Requires approximately 2 acre area for landfarming.	Moderate capital and O&M costs.	Uncertain effectiveness.	No
	Incineration	Rotary Kiln	Contaminated soils are incinerated in a high temperature, oxygen-rich reactor to oxidize the organic constituents of the soil.	Effective in reducing contamination and toxicity. Negligible reduction in volume.	Implementable. On-site or off-site operations available.	High capital costs. No long-term O&M costs.	May not be practical for low volume soils (e.g. less than 10,000 CY). Proven effective soil remedial technology.	Yes
		Fluidized Bed	Contaminated soil is "fluidized" with heated air directed through the waste. The soil is heated directly with propane or other fuel.	Effective in reducing contamination and toxicity. Negligible reduction in volume.	Implementable. On-site or off-site operations limited availability.	High capital costs. No long-term O&M costs.	May not be practical for low volume soils (e.g. less than 10,000 CY). Limited availabilty of mobile units.	No
	Thermal Desorption	Rotary Kiln	Contaminated soils are heated in a rotating reactor to volatilize the organic constituents of the soil. The off-gases are condensed and collected for disposal.	Effective in reducing contamination and toxicity. Negligible reduction in volume.	Implementable. On-site or off-site operations available.	High capital costs. No long-term O&M costs.	May not be practical for low volume soils. Proven effective soil remedial technology.	Yes
		Screw Auger	Contaminated soil fed through heated augers which act to both heat and turn soil.	Effective in reducing contamination and toxicity. Negligible reduction in volume.	Implementable. On-site or off-site operations limited availability.	High capital costs. No long-term O&M costs.	May not be practical for low volume soils (e.g. less than 10,000 CY). Limited availabilty of mobile units.	No

TABLE 4.1 (CONT'D)

INITIAL IDENTIFICATION AND SCREENING OF TECHNOLOGIES

IBS SITE
PEORIA, ILLINOIS

General Response Action	Remedial Technology	Process Option	Process Description	Effectiveness	Implementability	Cost	Screening Comments	Retained for Development of Remedial Alternatives
Treatment (cont'd)	Physical/Chemical Treatment	Soil Screening	Mechanical separation of soil material based upon the particle size distribution.	Used in conjunction with other technologies to reduce the volume of soil to be treated.	Implementable. Typically conducted on-site.	Low capital costs. No O&M costs. costs.	Effective for reducing the volume of contaminated soils requiring treatment.	Yes
		Soil Washing	Contaminated soils are washed with non-toxic solvents to extract soil-bound contaminants. Treated soil backfilled on-site.	Effective in removing contaminants from the site soils.	Implementable. Typically conducted on-site.	Moderate capital costs. No long-term O&M costs.	Effective for reducing the volume of contaminated soils requiring treatment.	Yes
		Stabilization/Fixation	Reduces mobility and exposure potential by binding the contaminant into a fixed state.	Reduces contaminant mobility. In-situ treatment requires site usage restrictions.	Implementable, on-site or off-site.	Moderate capital costs. Low O&M costs.	Restricts site use, if conducted on-site. Treated waste remains on-site or requires disposal. No contaminant reduction.	No
		Vitrification	Reduces mobility and exposure potential by fusing the inorganic matrix of the soil, either volatilizing the contaminants or encasing them in the vitrified mass.	Reduces contaminant mobility and exposure potential. Site usage restrictions.	Implementable.	High capital costs. Low O&M costs.	Restricts site use.	No
Removal	Excavation	Excavation	Contaminated soils are removed by use of mechanical implements. Excavated areas backfilled with clean soil.	Contaminants removed from the affected areas.	Commonly implemented. Temporary removal of railroad tracks required.	Low capital costs. No O&M costs.	Significant reduction in risk by removal. Must be used in conjunction with other treatment technologies.	Yes
Disposal	On-Site Landfilling	On-Site TSCA Landfill	Cell constructed on-site for disposal of listed hazardous wastes (PCB concentration > 50 ppm).	Reduces contaminant exposure. Long-term O&M plus monitoring required.	Requires significant area of land for disposal cell. Site use restrictions. Flood protection required.	High capital and O&M costs.	Restricts site use. Contaminants remain on-site. No reduction in contamination.	No
		On-Site Landfill	Cell constructed on-site for disposal of non-hazardous wastes (PCB concentration < 50 ppm).	Reduces contaminant exposure. Long-term O&M plus monitoring required.	Requires significant area of land for disposal cell. Site use restrictions. Flood protection required.	High capital and O&M costs.	Restricts site use. Contaminants remain on-site. No reduction in contamination.	No
	Off-Site Landfilling	Off-Site TSCA Landfill	Contaminated soils with PCB concentrations >50 ppm are disposed of in a TSCA-permitted landfill.	Effectively removes contaminated soils from site. Provides risk reduction through containment.	Implementable.	High capital costs. No O&M costs.	Contaminated soils removed from site. Commonly used for low volumes of soil (e.g. less than 5,000 CY).	Yes
		Off-Site Landfill	Contaminated soils with PCB concentrations <50 ppm are disposed of in a solid waste landfill.	Effectively removes contaminated soils from site. Provides risk reduction through containment.	Implementable.	Low capital costs. No O&M costs.	Contaminated soils removed from site. Commonly used for low volumes of soil (e.g. less than 5,000 CY).	Yes

4.1 NO ACTION

The no action response is required by NCP guidance to be carried through the detailed analysis of alternatives. This response action is not effective in reducing the potential risks to receptors or the environment and is unlikely to be acceptable to the community or to government agencies.

The no action response would be acceptable based upon the results of the Focused Risk Assessment. However, this response would be inconsistent with the USEPA's cleanup guidance for sites with soils contaminated with PCBs (USEPA 1990).

This option will be retained, as required by the NCP, through the entire technology screening process.

4.2 INSTITUTIONAL CONTROLS

Institutional controls are effective at reducing exposure to contamination by restricting access to the contaminated areas to the general public or to Site workers. Common institutional controls include installing fencing or establishing deed restrictions. Neither of these technologies would reduce Site contamination.

Institutional controls may be used as the sole remedy or in conjunction with other technologies such as containment or on-site disposal.

intended for disclosure to subsequent owners of the property should ownership be transferred.

Although deed restrictions would likely not be effective as a sole remedy, they may be used in conjunction with other remedial technologies, such as concrete capping and on-site disposal, and will be retained for further analysis.

4.3 CONTAINMENT

Containment at PCB-contaminated Sites typically involves constructing a soil cover over the contaminated soil (e.g. capping) to restrict direct exposure, migration via erosion and the infiltration of precipitation through the contaminated soil zone.

Low permeability caps are typically employed for situations where leaching of contaminants to groundwater is a principle exposure pathway. For these types of situations, clay or synthetic membrane caps are considered due to their effectiveness at reducing infiltration and leaching. Soil covers are more commonly employed for PCB-contaminated soils (USEPA 1990) where the principle exposure pathway is dermal contact or incidental ingestion.

Vertical containment typically involves implementing measures to restrict groundwater movement, such as a slurry wall. Vertical trenches would be excavated around the contaminated soil areas and soil by approximately one order of magnitude (USEPA 1990). However, no reduction in contaminant toxicity or volume would occur with this treatment technology.

The most significant factor concerning the effectiveness of this technology is the future restriction of heavy equipment from traveling over the capped areas. Erosion caused by the heavy equipment operations could lead to deterioration and would require maintenance of the cap. The railroad tracks present in the areas of contaminated soils to be capped would need to be temporarily removed for placement of the soil cap in those areas.

Due to the location of the IBS Site within the 100-year floodplain of the Illinois River, appropriate flood control protection would need to be installed to prevent the washout of the soil cap.

The capital costs for the soil cap would be relatively low. Long-term monitoring may be required and the O&M costs would also be relatively low.

Due to the low potential for long-term effectiveness and the site use restrictions, this technology will not be retained for further analysis.

Asphalt Cap

This remedial action involves constructing an asphalt cap over the contaminated soil areas. The construction of an asphalt cap would this technology is low and, as such, this technology will not be retained for further analysis.

Concrete Cap

This remedial action involves constructing a concrete cap over the contaminated soil areas. This option would require minimal grading and would allow the use of most heavy equipment over the capped areas. This alternative would be effective in reducing the exposure potential and the mobility of the soil-bound PCBs. This option would allow the continued use of the contaminated areas of the Site while significantly reducing the contaminant exposure.

A concrete cap offers a durable cover material which could withstand heavy equipment. However, routine maintenance would be required.

The railroad tracks present in the areas of contaminated soils to be capped may need to be temporarily removed for placement of the concrete cap in those areas. The IBS Site is located within the 100-year floodplain of the Illinois River. The concrete cap would provide adequate protection against washout of contaminated soil.

The capital costs for the concrete cap would be moderate. Long-term O&M costs would be relatively low.

Due to the site use restrictions which would need to be implemented, this technology will not be retained for further analysis.

4.3.2 Vertical Barriers

Vertical barriers are intended to contain horizontally flowing groundwater. Vertical containment barriers would not be applicable for the IBS Site since the observed contamination is present in surficial soils.

This technology will not be retained for further analysis.

4.4 TREATMENT

Several technologies are available for treating contaminated soil, either on-site or off-site, to reduce the toxicity, mobility and volume. These technologies include bioremediation, incineration, thermal desorption and physical/chemical treatment.

4.4.1 Bioremediation

This technology is designed to reduce the concentrations of the target contaminants by using microorganisms to utilize the contaminants as substrate, thus degrading the contaminants of concern.

floodplain of the Illinois River, appropriate flood control protection would need to be installed to prevent the washout of the treatment zone and associated contaminated soils.

The capital costs of this technology would be moderate with moderate O&M costs.

Since significant site use restrictions would need to be implemented for this technology and because of the uncertainties of its effectiveness, this technology will not be retained for further analysis.

Slurry-Phase Bioremediation Treatment

This technology involves placing excavated soil and nutrients within a tank with water to form a slurry mixture, typically exhibiting 10% to 20% solids. The pH, oxygen level and temperature of the slurry mixture would be maintained at optimum levels to provide efficient degradation of the contaminants. The slurry is mixed using mechanical agitation.

This treatment technology would be performed on-site, lowering the capital costs by eliminating the need for off-site transport of the contaminated soils. However, this technology generates process wastes which must be treated either on-site or off-site. This treatment technology may be a rather long process and requires a temperature-controlled environment.

The capital and O&M costs for this technology would be moderate.

Because of the uncertainties of the long-term effectiveness, this technology will not be retained for further analysis.

4.4.2 Incineration

Incineration is an ex-situ technology which uses an oxygen-rich, high temperature process to destroy the organic constituents, including the organic contaminants, of the excavated soil. This technology effectively reduces the mobility, toxicity, and volume of contaminants within the soil. A negligible reduction in soil volume would occur.

Incineration may be performed with mobile incinerators, either on-site or off-site, each requiring that the contaminated soils be first excavated, the soil screened to remove the larger debris and the waste products be disposed of in an appropriate manner. The flue gases require treatment, such as particulate filtration, to remove residual contaminants prior to the emission to the atmosphere. The waste products of this technology are the treated soil which could be backfilled on-site or disposed of in a landfill, and the atmospheric emissions. Minimal amounts of fly ash and slag may be formed during combustion and would require appropriate off-site disposal.

A high mobilization/demobilization cost is associated with the use of the mobile rotary kiln incinerator. In addition, considerable costs would be incurred related to obtaining the permits required to operate the incinerator. As such, this type of treatment is not commonly implemented for sites, such as IBS, which involve relatively low volumes of soil to be treated.

Since rotary kiln incineration of PCB-contaminated soil is commonly performed and is very effective at reducing contamination, this technology will be retained for further analysis.

Fluidized Bed Incineration

The fluidized bed incinerator consists of a chamber which "fluidizes" the soil by directing air upward through the waste. The soil is heated directly by using propane or other fuel, or indirectly by heating the air used for fluidization. The wastes are fed to the fluidization bed via screw augers and are typically discharged by screw augers or through gravity.

The use of the fluidized bed incineration is not as common as rotary kiln incineration and fewer mobile units are available. As such, this technology will not be retained for further analysis.

that the rotary kiln desorber volatilizes the organic contaminant instead of oxidizing (destroying) the contaminants. Rotary kiln thermal desorption is commonly used for effective treatment of PCB-contaminated soils and mobile units are readily available.

A high mobilization/demobilization cost is associated with the use of the mobile rotary kiln thermal desorber. In addition, considerable costs would be incurred related to obtaining the permits required to operate the unit. As such, this type of treatment is not commonly implemented for sites, such as IBS, which involve relatively low volumes of soil to be treated.

The capital costs are considered high and no long-term O&M costs would be incurred.

Since rotary kiln thermal desorption has been shown to be effective at treating PCB-contaminated soils, this technology will be retained for further analysis.

Screw Auger

The screw auger thermal desorber consists of a chamber which contains one or more indirectly heated hollow screw augers. The screw augers serve two purposes by heating the soil material and to induce mixing to maximize thermal contact and contaminant volatilization. As with the rotary kiln thermal desorber, the off-gases are condensed for the

Soil Screening

Soil screening is used to reduce the volume of contaminated soil requiring treatment or disposal. This is accomplished by removing the gravel from the contaminated soil with portable mechanical screening units. Conventional organic sorption theory states that the mass of contaminants sorbed to soil particles is proportional to the fraction organic carbon (f_{oc}) associated with the solid particles. On a mass basis, smaller diameter particles will have a higher f_{oc} and higher surface area-to-mass ratio. Therefore, the removal of gravel from the excavated soil would not effectively remove the mass of PCBs from the soil, but would significantly reduce the volume of soil requiring treatment or disposal.

This technology would be implemented in conjunction with other technologies and could be readily implemented at low capital cost. No O&M costs would be incurred.

Due to the overall cost saving potential, this technology will be retained for further analysis.

Soil Washing

Soil washing is an extraction process which chemically washes the soil particles of organic contaminants. The excavated soil is first screened to remove large debris (greater than 3 inches) which is then either crushed and subjected to the soil washing process, or is disposed of separately.

processes would not be feasible since the future use of the treated area would be restricted.

The capital costs for implementation would be moderate and the O&M costs low.

This technology will not be retained for further analysis.

Vitrification

In-situ vitrification technology involves passing a high electrical voltage through the area of soil to be treated. This high voltage produces a high amount of heat which converts the inorganic soil mass into a pyrolyzed mass of low leachability potential. Organic contaminants would either be encased within the glass-like mass, or would be volatilized and collected with a fume hood.

The capital costs for implementation of this technology are high with low O&M costs.

Because of the in-situ nature of the vitrified mass, the future site use of the treated area would be restricted. As such, this technology will not be retained for further analysis.

constructed on-site or within an existing, permitted, off-site facility. The type of landfill construction for the disposal of the contaminated soils would depend upon the hazardous characteristics of the waste to be disposed.

4.6.1 On-Site Landfilling

The on-site disposal of the contaminated soils would require the construction of a landfill cell within the Site and require long-term maintenance and monitoring. The landfill cell would occupy a portion of the Site which would restrict the future use of that area.

Since the IBS Site is located within the 100-year floodplain of the Illinois River, appropriate flood control measures would need to be constructed.

On-Site TSCA Landfill

Soils exhibiting PCB concentrations in excess of 50 mg/kg would be disposed of in a landfill cell constructed on-site according to TSCA regulations. This technology would be effective in terms of reducing the exposure and mobility of the contaminants, but no reduction in contamination would occur. The contaminants would remain on-site and the owner would retain the long-term responsibility of the contaminated soil.

The capital and O&M costs would be high and long-term monitoring would be required.

exhibiting PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed of at an off-site solid waste landfill.

Off-Site TSCA Landfill

The disposal of soils contaminated with PCBs at concentrations in excess of 50 mg/kg* in a TSCA-permitted landfill would reduce the potential for risk to human health and the environment at the Site over the long term. This process does not, however, reduce the toxicity or the volume of soil, but is effective at containing contamination. This technology provides risk reduction through containment. This technology is commonly implemented with PCB-contaminated soils.

The capital costs would be high, no direct O&M costs would be incurred and the contaminated soils would no longer be present on-site.

Due to the effectiveness and common use of off-site landfills for disposal of PCBs, this technology will be retained for further analysis.

Off-Site Solid Waste Landfill

Soils exhibiting PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed at an off-site solid waste landfill. In

* Note: Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

It should be noted that although the no action response action would be acceptable based upon the results of the Focused Risk Assessment, this response action would not be in accordance with the USEPA's cleanup guidance for sites with PCB-contaminated soils.

4.7.2 Institutional Controls

Deed restrictions may be implemented to restrict the future use of the Site when remedial technologies are implemented which do not remove the contamination from the Site. The deed restrictions are implemented to make current and future landowners aware of the Site contamination if the Site should ever be sold or transferred. Deed restrictions may be implemented in conjunction with capping, fencing, or in-situ treatment options.

Site fencing is effective in reducing the risk in terms of the exposure due to dermal contact, inhalation and incidental ingestion of contaminated soil. Since much of the IBS Site is presently fenced, completing the enclosure of the IBS could be implemented relatively easily. If remedial alternatives of on-site disposal or ex-situ treatment cells are constructed on-site, more localized fencing could be implemented.

Screening of the contaminated soils can significantly reduce the volume of soils requiring treatment or disposal, at a relatively low cost.

The soil washing of the contaminated soils can extract the contaminants from the soil particles. This technology is most effective with granular soils and decreases in effectiveness for fine-grained soils such as silt and clay.

4.7.5 Removal

The excavation of contaminated soils can be readily implemented and will effectively reduce the toxicity and exposure potential from the affected areas. The railroad tracks which are present within the areas to be excavated would need to be temporarily removed. Excavation would be performed in conjunction with either the treatment or disposal options.

4.7.6 Disposal

Two disposal options will be retained for further analysis: off-site landfilling in a TSCA-permitted landfill and off-site landfilling in a solid waste landfill. These options are viable for the IBS Site remedial action since the contaminated soil would be moved to an off-site location, thus reducing the exposure potential and long-term responsibility of the owner.

- Soil Washing;
- Excavation;
- Off-Site TSCA Landfill Disposal and
- Off-Site Solid Waste Landfill Disposal.

construction in the areas where soils have been identified as exhibiting PCB concentrations in excess of 10 mg/kg would be prohibited.

The Site would be secured by installing 8-foot high, barbed wire topped, chain link fence in those areas lacking proper fencing. This fencing would be installed to minimize exposure to trespassers.

5.1.3 Concrete Cap and Deed Restrictions

A concrete cap would be constructed over the contaminated soil areas. Site use restrictions would be added to the property deed.

5.1.4 Excavation, Concrete Cap and Deed Restrictions

Soils with PCB concentrations between 10 mg/kg and 50 mg/kg* would be excavated and disposed of at a solid waste landfill. A concrete cap would be constructed over the soils with PCB concentrations greater than 50 mg/kg. Site use restrictions would be added to the property deed.

* Note: The intent of this alternative is to dispose of PCB-contaminated soil at a Subtitle D facility. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

5.1.9 Excavation and Off-Site Disposal

Soils exhibiting PCB concentrations greater than 10 mg/kg would be excavated. Soils with PCB concentrations greater than 50 mg/kg would be disposed of at an off-site TSCA-permitted landfill. Soils with PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed of at an off-site solid waste landfill.

5.1.10 Excavation, Soil Washing and Off-Site Disposal

Soils exhibiting PCB concentrations greater than 10 mg/kg would be excavated for treatment by soil washing. Treated soils would be backfilled on-site. Extracted PCBs would be further treated and/or disposed off-site.

5.1.11 Excavation, Soil Screening and Off-Site Disposal

Soils exhibiting PCB concentrations greater than 10 mg/kg would be excavated. Excavated soils exhibiting PCB concentrations greater than 50 mg/kg would be screened to remove the gravel. Screened soils would be disposed of at an off-site TSCA-permitted landfill. The gravel and

* Note: The intent of this alternative is to dispose of PCB-contaminated soil at a Subtitle D facility. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

TABLE 5.1

DEVELOPMENT AND SCREENING OF POTENTIAL REMEDIAL ALTERNATIVES

IBS SITE
PEORIA, ILLINOIS

Remedial Alternative	Process Description	Effectiveness	Implementability	Costs	Screening Comments	Retained for Detailed Analysis of Alternatives
No Action	No action.	No reduction in risk.	No action required.	Capital - $0 O&M - $0 Present Worth - $0	Required by NCP to be carried through the entire technology analysis process.	Yes
Institutional Controls	Restrict access to contaminated areas by installing perimeter fencing. Implement deed restrictions.	Reduction in exposure risk. Restricts site use. No reduction in contamination.	Implementable. Much of site is already fenced.	Capital - $116,000 O&M - $1,000 Present Worth - $125,000	Restricts site use. No reduction in contamination. No reduction in exposure risk.	No
Concrete Cap and Deed Restrictions	A concrete cap would be constructed over the contaminated areas. Deed restrictions.	Reduces exposure by containment. No reduction in contamination.	Implementable. Flood protection provided..	Capital - $935,000 O&M - $2,000 Present Worth - $953,000	No site use restrictions. No reduction in contamination.	Yes
Excavation, Concrete Cap and Deed Restrictions	Soils with PCBs between 10 mg/kg and 50 mg/kg would be excavated and disposed at a solid waste landfill. A concrete cap would be constructed over soils with PCBs>50 mg/kg. Implement deed restrictions.	Reduces exposure by containment. No reduction in contamination.	Implementable. Flood protection provided..	Capital - $592,000 O&M - $2,000 Present Worth - $611,000	No site use restrictions. Minimal reduction in contamination.	Yes
Excavation and On-Site Thermal Desorption	Soils with PCB concentrations >10 mg/kg excavated for on-site thermal desorption treatment. Treated soils backfilled on-site.	Effective in reducing contamination and toxicity.	Implementable. Extensive set-up and permitting requirements.	Capital - $4,107,000 O&M - $0 Present Worth - $4,107,000	Not be practical for low volume soils. Proven effective soil remedial technology.	Yes
Excavation and Off-Site Thermal Desorption	Soils with PCB concentrations >10 mg/kg excavated for on-site thermal desorption treatment. Treated soils disposed in off-site solid waste landfill.	Effective in reducing contamination by treatment. Negligible reduction in volume.	Implementable. Extensive set-up and permitting requirements.	Capital - $4,438,000 O&M - $0 Present Worth - $4,438,000	Not be practical for low volume soils. Proven effective soil remedial technology. Additional transportation costs incurred.	No
Excavation and On-Site Incineration	Soils with PCB concentrations >10 mg/kg excavated for on-site incineration. Treated soils backfilled on-site.	Effective in reducing contamination by treatment. Negligible reduction in volume.	Implementable. Extensive set-up and permitting requirements.	Capital - $5,442,000 O&M - $0 Present Worth - $5,442,000	Not be practical for low volume soils (e.g. less than 10,000 CY). Proven effective soil remedial technology.	No
Excavation and Off-Site Incineration	Soils with PCB concentrations >10 mg/kg excavated for off-site incineration. Treated soils disposed in off-site solid waste landfill.	Effective in reducing contamination by treatment. Negligible reduction in volume.	Implementable. Extensive set-up and permitting requirements.	Capital - $5,799,000 O&M - $0 Present Worth - $5,799,000	Not be practical for low volume soils (e.g. less than 10,000 CY). Proven effective soil remedial technology. Additional transportation costs incurred.	No
Excavation and Off-Site Disposal	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg disposed in a off-site TSCA-permitted landfill. Soils with PCBs between 10 and 50 mg/kg disposed in off-site solid waste landfill.	Effectively removes contaminated soils from site. Provides risk reduction through containment.	Implementable.	Capital - $1,748,000 O&M - $0 Present Worth - $1,748,000	Contaminated soils removed from site. Commonly used for low volumes of soil (e.g. less than 5,000 CY).	No
Excavation and Soil Washing	Soils with PCBs >10 mg/kg excavated for soil washing. Treated soil backfilled on-site. Extracted PCBs removed off-site for further treatment and/or disposal.	Effectively removes contaminated soils from site. Provides risk reduction through treatment.	Implementable. Extensive set-up and permitting requirements.	Capital - $1,962,000 O&M - $0 Present Worth - $1,962,000	Contaminated soils removed from site. Commonly used for low volumes of soil (e.g. less than 5,000 CY).	Yes
Excavation, Soil Screening and Off-Site Disposal	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg subjected to soil screening. Concentrated soil disposed at off-site TSCA landfill. Soils with PCBs <50 mg/kg disposed at off-site solid waste landfill.	Effectively removes contaminated soils from site. Provides risk reduction through containment. Soil screening effectively reduces volume of soil requiring disposal at TSCA-permitted landfill.	Implementable. Requires temporary removal of railroad tracks.	Capital - $1,494,000 O&M - $0 Present Worth - $1,494,000	Contaminated soils removed from site. Commonly used for low volumes of soil (e.g. less than 5,000 CY).	Yes

TABLE 5.2

SUMMARY OF ESTIMATED COSTS FOR THE POTENTIAL REMEDIAL ALTERNATIVES

IBS SITE - PEORIA, ILLINOIS

Remedial Alternative	Process Description	Capital Costs	Annual O&M Costs	Total Present Worth
No Action	No action.	$0	$0	$0
Institutional Controls	Restrict access to contaminated areas by installing perimeter fencing. Implement deed restrictions.	$116,000	$1,000	$125,000
Concrete Cap and Deed Restrictions	A concrete cap would be constructed over the contaminated areas. Deed restrictions.	$935,000	$2,000	$953,000
Excavation, Concrete Cap and Deed Restrictions	Soils with PCBs between 10 mg/kg and 50 mg/kg would be excavated and disposed at a soild waste landfill. A concrete cap would be constructed over soils with PCBs>50 mg/kg. Implement deed restrictions.	$592,000	$2,000	$611,000
Excavation and On-Site Thermal Desorption	Soils with PCB concentrations >10 mg/kg excavated for on-site thermal desorption treatment. Treated soils backfilled on-site.	$4,107,000	$0	$4,107,000
Excavation and Off-Site Thermal Desorption	Soils with PCB concentrations >10 mg/kg excavated for off-site thermal desorption treatment. Treated soils disposed in off-site solid waste landfill.	$4,438,000	$0	$4,438,000
Excavation and On-Site Incineration	Soils with PCB concentrations >10 mg/kg excavated for on-site incineration. Treated soils backfilled on-site.	$5,442,000	$0	$5,442,000
Excavation and Off-Site Incineration	Soils with PCB concentrations >10 mg/kg excavated for off-site incineration. Treated soils disposed in off-site solid waste landfill.	$5,799,000	$0	$5,799,000
Excavation and Off-Site Landfilling	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg disposed in a off-site TSCA landfill. Soils with PCBs <50 mg/kg disposed in off-site solid waste landfill.	$1,748,000	$0	$1,748,000
Excavation and Soil Washing	Soils with PCBs >10 mg/kg excavated for soil washing. Treated soil backfilled on-site. Extracted PCBs removed off-site for further treatment and/or disposal.	$1,962,000	$0	$1,962,000
Excavation, Soil Screening and Off-Site Landfilling	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg subjected to soil screening. Concentrated soil disposed at off-site TSCA landfill. Soils with PCBs <50 mg/kg disposed at off-site solid waste landfill.	$1,494,000	$0	$1,494,000

5.2.3 Concrete Cap and Deed Restrictions

Concrete capping of contaminated soils would provide effective protection through isolation of the contaminated soil from direct human exposure. The concrete cap would also mitigate the infiltration of water through the soil. Since PCBs inherently exhibit low mobility, the contaminants will remain immobile indefinitely. An added benefit of the concrete cap is that it minimizes restrictions on site use.

Future site use and development restrictions would be placed on the property deed to restrict the excavation or construction in those areas of the Site where the concrete cap was placed.

The temporary removal of the railroad tracks may be required and may impact the Site operations during construction.

The capital costs for this alternative are estimated to be $935,000 with annual O&M costs of $2,000. The total present worth of this potential alternative, assuming 30 years of O&M at a discount rate of 10%, is estimated at $954,000.

This alternative will be retained for detailed analysis as a potential remedial alternative.

The temporary removal of the railroad tracks may impact the Site operations during construction.

The capital costs for this alternative are estimated to be $592,000 with annual O&M costs of $2,000. The total present worth of this potential alternative, assuming 30 years of O&M at a discount rate of 10%, is estimated at $611,000.

This alternative will be retained for detailed analysis as a potential remedial alternative.

5.2.5 Excavation and On-Site Thermal Desorption

Excavation and thermal desorption of the PCB-contaminated soils provides an effective means of treating PCBs. This is due to the removal of the PCBs from the soil matrix for off-site treatment and/or disposal. The treated soil would be backfilled on-site. Excavated soil would be treated in a thermal desorption unit operating at a temperature of approximately 1400°F. The volatilized contaminants are condensed from the off-gases and collected for off-site treatment and/or disposal.

A principle factor affecting the implementation of this remedial alternative is the ability to obtain required permits. This alternative will require a substantial effort to mobilize and demonstrate the effectiveness of technology.

The capital costs for this alternative are estimated to be $4,438,000 with no O&M costs incurred.

Given the above, this alternative will not be retained for detailed analysis as a potential remedial alternative.

5.2.7 Excavation and On-Site Incineration

Excavation and incineration of the PCB-contaminated soil provides an effective means of treating PCBs. The excavated soil is fed to the incinerator on a continuous basis and is incinerated at a temperature between 1600°F and 2000°F. The off-gases are subjected to air pollution controls prior to emission into the atmosphere. The treated soil would be backfilled on-site.

A principle factor affecting the implementation of this remedial alternative is the ability to obtain required permits. Incineration typically takes a substantial administrative effort to gain regulatory approvals and public acceptance. In addition, this alternative has a high mobilization and start-up cost.

The capital costs for this alternative is estimated to be $5,442,000 with no O&M costs incurred.

Since incineration has significantly higher capital costs than thermal desorption and both will effectively treat PCBs, this alternative will not be retained for detailed analysis as a potential remedial alternative.

5.2.9 Excavation and Off-Site Landfilling

The excavation of contaminated soils with PCB concentrations greater than 10 mg/kg would provide an effective method of reducing the exposure potential at the Site. Soil excavation is a commonly applied practice for reduction in risk at sites with soils contaminated with PCBs. Excavated soil with PCB concentrations greater than 50 mg/kg would be disposed of at a TSCA-permitted landfill. Excavated soil with PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed at a solid waste landfill.

One of the minor difficulties which would be encountered with the implementation of this alternative is the removal and replacement of railroad tracks within the areas where contaminated soil is to be excavated. The temporary removal of the railroad tracks may impact the Site operations during construction.

The capital costs for this alternative are estimated at $1,748,000 with no O&M costs incurred.

Since the excavation and soil screening alternative (discussed in Section 5.2.1) administers the same effectiveness at a

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* Note: The intent of this alternative is to dispose of PCB-contaminated soil at a Subtitle D facility. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

excavation is a commonly applied practice for reduction in risk at sites with soils contaminated with PCBs. Soils with PCBs greater than 50 mg/kg would be screened to remove gravel. Since gravel does not adsorb PCBs to a significant extent, gravels would typically exhibit PCB concentrations less than 50 mg/kg. The screening of soil contaminated with PCBs at concentrations greater than 50 mg/kg would reduce the amount of soils requiring disposal at a TSCA-permitted landfill. Soil screening, which has a low capital cost in itself, would lower the high costs of transportation to and disposal at a TSCA-permitted landfill by decreasing the soil volume.

Screened soils would be disposed of at a TSCA-permitted landfill. Screened-out soils exhibiting PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed of at a solid waste landfill. Treated soils exhibiting PCB concentrations less than 10 mg/kg would be backfilled on-site.

One of the difficulties which would be encountered with the implementation of this alternative is the removal and replacement of railroad tracks within the areas where contaminated soil is to be excavated. The temporary removal of the railroad tracks may be required and may impact the Site operations during construction.

The capital costs of this alternative would be $1,494,000 with no O&M cost incurred.

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* Note: The intent of this alternative is to dispose of PCB-contaminated soil at a Subtitle D facility. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of six potential remedial alternatives. These remedial alternatives will be analyzed individually using the evaluation criteria suggested by the NCP. The selected alternatives will then be compared to each other.

6.1 EVALUATION CRITERIA

Nine evaluation criteria have been developed by the USEPA and are described in the NCP and the CERCLA guidance documents. These nine evaluation criteria include:

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility or volume through treatment;
- short-term effectiveness;
- implementability;
- cost;
- support agency acceptance and
- community acceptance.

focus of this evaluation is the extent and effectiveness of the controls which may be required to manage the risk associated with the treatment residuals and/or the untreated wastes.

Components of this criterion which will be addressed include the measure of the magnitude of the residual risk associated with the remaining treatment residuals or untreated wastes upon the completion of the remedial alternative, and the adequacy, reliability and suitability of the controls used to manage the treatment residuals or untreated wastes which may have been implemented as part of the remedial alternative.

6.1.4 Reduction of Toxicity, Mobility or Volume Through Treatment

The reduction of toxicity, mobility or volume through treatment criterion addresses the statutory preference for selecting remedial actions which implement treatment technologies that permanently and significantly reduce the toxicity, mobility or volume of the hazardous contaminants. This preference is satisfied when treatment is implemented to reduce the principle threats at a site through destruction of the hazardous compounds, reduction in the total mass of the contaminant, irreversible reduction in contaminant mobility or reduction in the total volume of contaminated media.

This evaluation will focus upon the following specific factors for each alternative:

This evaluation will focus upon the following factors:

- protection of the community during implementation of the remedial actions;

- protection of the workers during implementation of the remedial actions;

- potential adverse environmental impacts which may result from the construction and implementation of the remedial action and the reliability of mitigation measures in preventing or reducing the potential impacts and

- length of time until the remedial action objectives are achieved.

6.1.6 Implementability

The implementability evaluation criterion addresses the technical and administrative feasibility of implementing the proposed remedial alternative and the availability of various services and materials required during its implementation.

This evaluation criterion includes the analysis of the following factors:

both direct (construction) capital costs such as equipment, labor and materials, and indirect (non-construction and overhead) capital costs such as engineering, financial and permitting costs.

6.1.8 Support Agency Acceptance

The support agency acceptance criterion addresses the technical and administrative issues and concerns the support agency may have regarding the proposed remedial alternative. This criterion is addressed once comments on the FS report and remedial plan have been completed. As such, this evaluation criterion will not be discussed in the detailed analysis of the potential remedial alternatives.

6.1.9 Community Acceptance

The community acceptance criterion addresses the issues and concerns the public may have regarding the remedial alternatives. This criterion is addressed once comments on the FS report and remedial plan have been received. As such, this evaluation criterion will not be discussed in the detailed analysis of the potential remedial alternatives.

TABLE 6.1

SUMMARY OF DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

IBS SITE
PEORIA, ILLINOIS

Evaluation Criteria	Alternative 1 No Action	Alternative 2A Concrete Cap and Deed Restrictions	Alternative 2B Excavation, Concrete Cap and Deed Restrictions	Alternative 3 Excavation and On-Site Thermal Desorption	Alternative 4 Excavation and Soil Washing	Alternative 5 Excavation, Soil Screening and Off-Site Landfilling
Process Description	No action.	A concrete cap would be installed over the contaminated areas. Deed restrictions would be placed on the property restricting site use to industrial activities.	Soils with PCBs between 10 mg/kg and 50 mg/kg would be excavated and disposed at a solid waste landfill. A concrete cap would be constructed over soils with PCBs >50 mg/kg. Implement deed restrictions.	Soils with PCB concentrations >10 mg/kg excavated for on-site thermal desorption treatment. Treated soils backfilled on-site.	Soils with PCBs >10 mg/kg excavated for soil washing. Treated soil backfilled on-site. Extracted PCBs removed off-site for further treatment and/or disposal	Soils with PCBs >10 mg/kg excavated. Soils with PCBs >50 mg/kg subjected to soil screening. Concentrated soil disposed at off-site TSCA landfill. Soils with PCBs <50 mg/kg disposed at off-site solid waste landfill.
Overall Protection of Human Health and the Environment	No improved protection of human health or the environment.	Effectively contains contaminated soil preventing ingestion, inhalation and dermal contact. Significant reduction in risk.	Effectively removes or contains contaminated soil preventing ingestion, inhalation and dermal contact. Significant reduction in risk.	Effectively removes PCBs from the site, significantly reducing risk.	Effectively removes PCBs from the site, significantly reducing risk.	Effectively removes PCBs from the site, significantly reducing risk.
Compliance with ARARs	Does not provide compliance with location- or chemical-specific ARARs. Not applicable to action-specific ARARs.	Concrete cap provides flood protection. Chemical-specific ARARs would be met through containment. Action-specific ARARs would be met.	Concrete cap provides flood protection. Chemical-specific ARARs would be met through containment. Action-specific ARARs would be met.	Location-, chemical- and action-specific ARARs compliance would be achieved.	Location-, chemical- and action-specific ARARs compliance would be achieved.	Location-, chemical- and action-specific ARARs compliance would be achieved.
Long-Term Effectiveness and Permanence	Would not provide long-term effectiveness or permanence since no measures will be taken to address contamination.	Provides long-term effectiveness and permanence but dependent upon effective maintenance of the cap. Durable, long-lasting concrete cap.	Provides long-term effectiveness and permanence but dependent upon effective maintenance of the cap. Durable, long-lasting concrete cap.	Since PCBs would be removed off-site, significant reduction in risk.	Since PCBs would be removed off-site, significant reduction in risk.	Since PCBs would be removed off-site, significant reduction in risk.
Reduction of Toxicity, Mobility or Volume Through Treatment	Not applicable since no treatment technology would be implemented.	No reduction in toxicity or volume. Reduces mobility by containment.	No reduction in toxicity. Some reduction in volume. mobility by containment.	Significantly reduces toxicity, mobility and volume through thermal desorption treatment.	Significantly reduces toxicity, mobility and volume through treatment.	Significantly reduces mobility through containment. No reduction in toxicity or volume.
Short-Term Effectiveness	Would not provide long-term effectiveness or permanence since no measures will be taken to address contamination.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.	Minimal risk incurred due to possible dust releases during construction.
Implementability	Not applicable since no treatment technology would be implemented.	No implementation problems expected.	No implementation problems expected.	Difficulty may be encountered with permitting and community acceptance.	No implementation problems expected.	No implementation problems expected.
Cost	No capital or O&M costs would be incurred since no treatment technology would be implemented.	Capital - $935,000 O&M - $2,000 Present Worth - $953,000	Capital - $592,000 O&M - $2,000 Present Worth - $611,000	Capital - $4,107,000 O&M - none Present Worth - $4,107,000	Capital - $1,962,000 O&M - none Present Worth - $1,962,000	Capital - $1,494,000 O&M - none Present Worth - $1,494,000

Assessment for the Site concluded that current exposure risks fall within USEPA's acceptable range of 1×10^{-6} to 1×10^{-4}.

Compliance with ARARs

This alternative would not provide compliance with the location-specific ARAR concerning flood protection. Compliance with chemical-specific ARARs would not be achieved since the Site PCBs would not be remediated.

It should be noted that although the no action alternative would be acceptable based upon the results of the Focused Risk Assessment, this alternative would be inconsistent with the USEPA's cleanup guidance for sites with soils contaminated with PCBs (USEPA 1990).

Long-Term Effectiveness and Permanence

This alternative would not provide long-term effectiveness or permanence since no remedial measures will be taken to address contamination.

Reduction of Toxicity, Mobility or Volume Through Treatment

This criterion is not applicable since no treatment technology would be implemented under this alternative.

A concrete cap would be constructed over those areas identified as having PCBs in excess of 10 mg/kg. The cap serves two principle functions by providing a low permeability barrier preventing the infiltration of water and reducing the exposure risk by separating Site workers from the contaminated soils. Those areas of the Site which would be covered with the concrete cap are depicted on Figure 6.1.

The construction of the concrete cap would include areas with active railroad tracks. These railroad tracks are utilized and would be maintained. The tracks may be temporarily removed to construct the concrete cap with provisions for re-installation of the tracks. The railroad bed would be graded as such to bring the final grade of the tracks to the final grade of the concrete pad.

The cap would be constructed with a 8-inch thick layer of reinforced concrete placed over a 6-inch thick granular base. The cap would be constructed to promote drainage. Figure 6.2 provides a cross-sectional view of the conceptual design for the proposed concrete cap with provisions for the railroad tracks.

Periodic inspection of the concrete cap area would be performed to identify cracks, seam material loss or the otherwise general condition of the concrete cap surface. Maintenance of the cap would be conducted as required based on the periodic inspections.

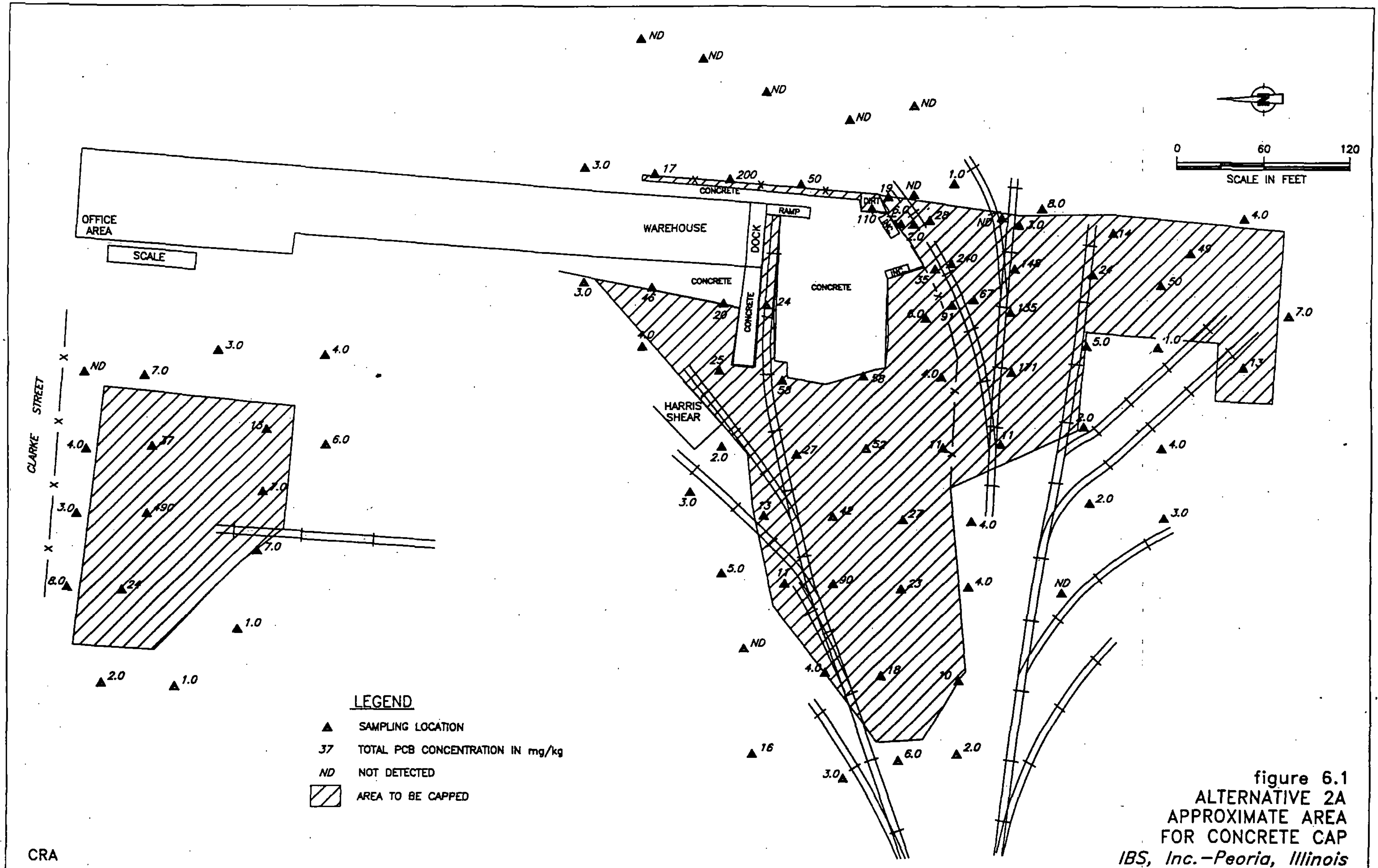

figure 6.1
ALTERNATIVE 2A
APPROXIMATE AREA
FOR CONCRETE CAP
IBS, Inc.–Peoria, Illinois

CRA
4310-6/11/92-M

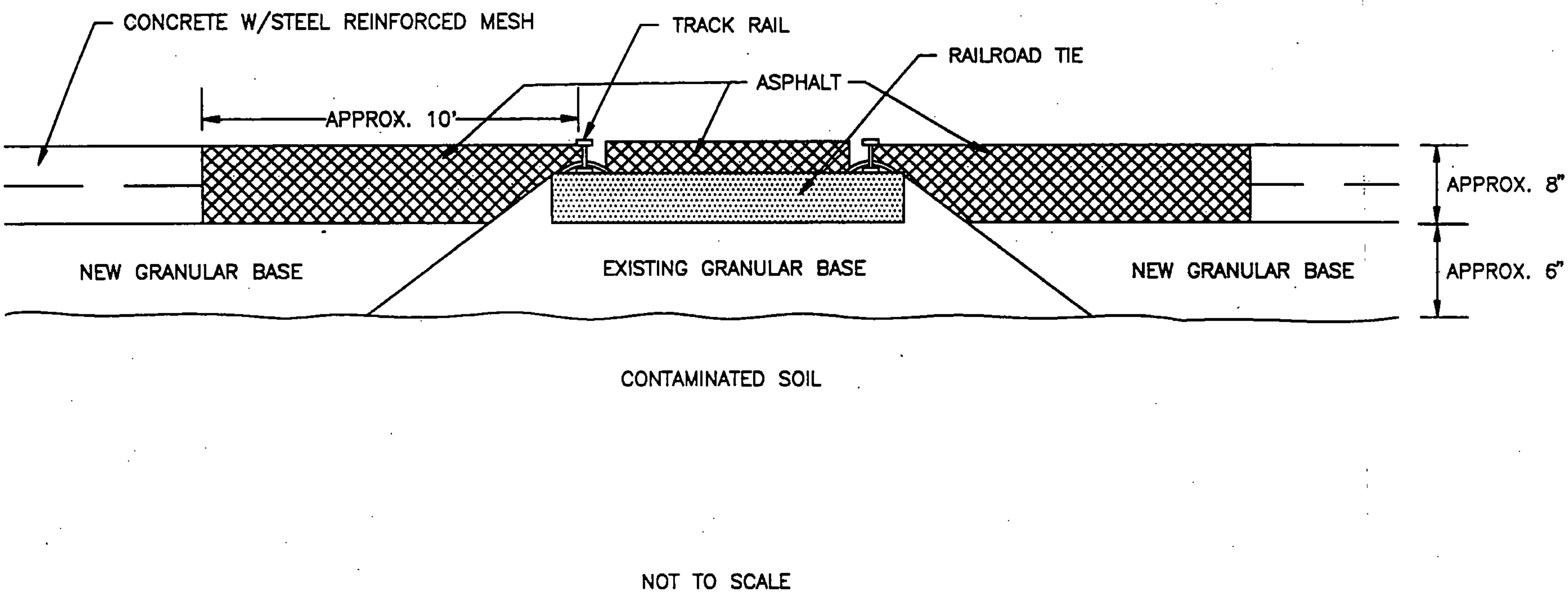

figure 6.2
ALTERNATIVES 2A AND 2B
CONCRETE CAP–CONCEPTUAL DESIGN
IBS, Inc.–Peoria, Illinois

CRA

4310–10/11/92–M

6.2.2.2 Assessment

Overall Protection of Human Health and the Environment

Protection would be accomplished through the containment of the contaminated soils by the concrete cap. The ingestion, inhalation and dermal contact of the contaminated soils would be prevented by the containment of the soils beneath the concrete cap. Hence, risks would be significantly reduced by implementation of this alternative through a significant reduction in exposure.

Compliance with ARARs

The placement of the concrete cap over contaminated soils would, in itself, provide flood protection. Chemical-specific ARARs would not be met since the PCB-contaminated soil would not be removed or treated. The action-specific ARARs would be met by this alternative.

Long-Term Effectiveness and Permanence

This alternative provides potential for long-term effectiveness and permanence and depends upon the effective maintenance of the concrete cap. It is anticipated that the concrete cap would remain durable, with only minimal maintenance required. The use of heavy equipment on the concrete surface may induce fractures in the concrete which would require sealing.

Capital	$ 935,000
Average Annual O&M	$ 2,000
Present Worth (30 yr., 10% Discount Rate)	$ 953,000

6.2.3 Alternative 2B – Excavation, Concrete Cap and Deed Restrictions

6.2.3.1 Description

Deed restrictions would be placed upon the property which would limit the future use of the Site to industrial-use only. The deed restriction would describe the areas of the Site which are contaminated with PCBs. This deed restriction would limit further excavation or construction in the capped areas.

Soils with PCB concentrations between 10 mg/kg and 50 mg/kg* would be excavated to a depth of 1 foot and disposed at a solid waste landfill.

A concrete cap would be constructed over those areas identified as having PCBs in excess of 50 mg/kg*. The cap serves two principle functions by providing a low permeability barrier preventing the infiltration of water and reducing the exposure risk by separating Site workers from the contaminated soils. Those areas of the Site which would be

* Note: The intent of Alternative 2B is to dispose of a portion of the PCB-contaminated soil at a Subtitle D facility to reduce the cap area. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

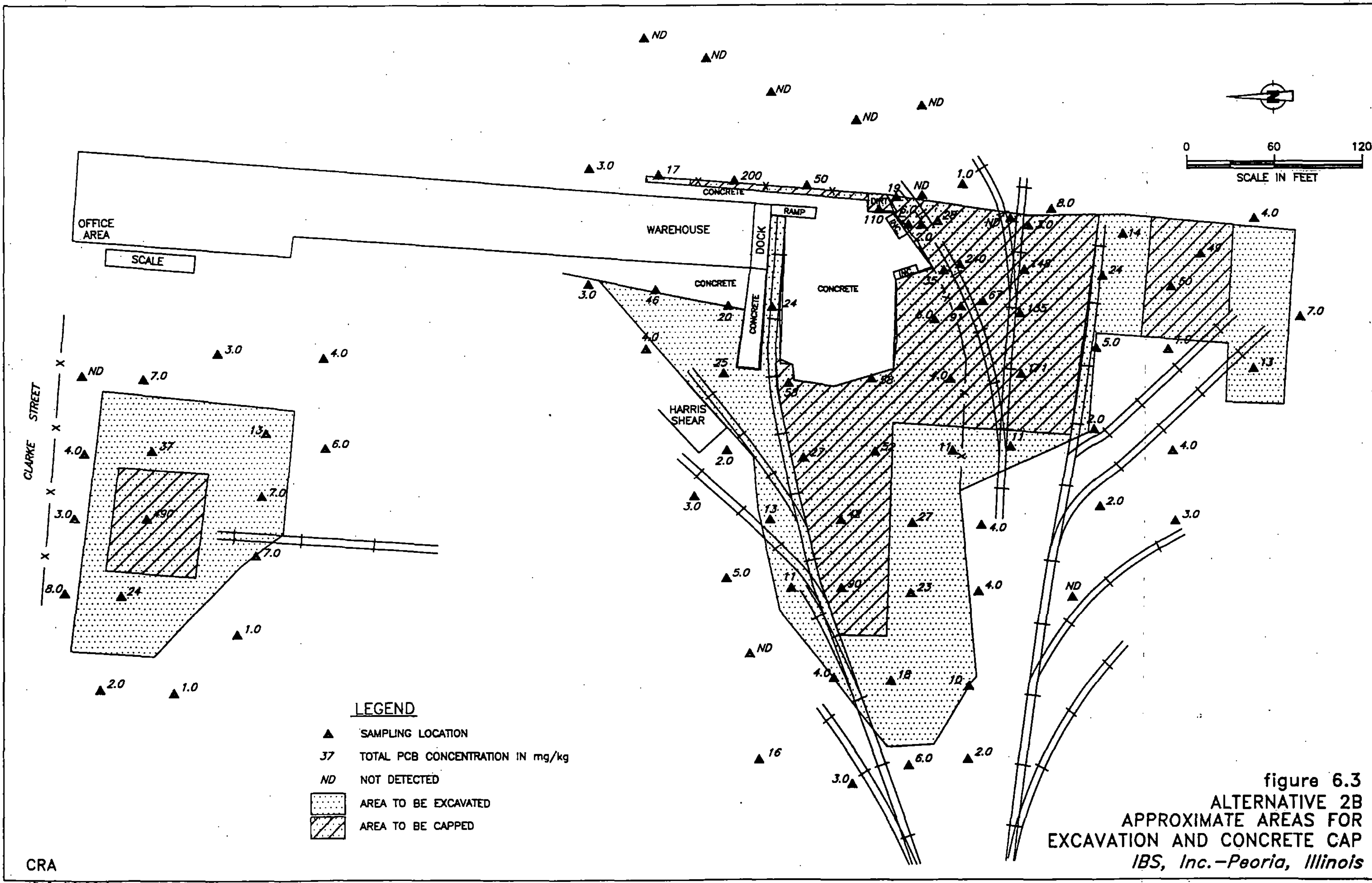

figure 6.3
ALTERNATIVE 2B
APPROXIMATE AREAS FOR
EXCAVATION AND CONCRETE CAP
IBS, Inc.–Peoria, Illinois

6.2.3.2 Assessment

Overall Protection of Human Health and the Environment

Protection would be accomplished through the removal of soils with PCB concentrations between 10 mg/kg and 50 mg/kg* and containment of soils contaminated with PCBs at concentrations greater than 50 mg/kg by the concrete cap. The ingestion, inhalation and dermal contact of the contaminated soils would be prevented by the containment of the soils beneath the concrete cap. Hence, risks would be significantly reduced by implementation of this alternative through a significant reduction in exposure.

Compliance with ARARs

The excavation of some contaminated soils and placement of the concrete cap over the remaining contaminated soils would provide flood protection. Chemical-specific ARARs would not be met for the capped soils since the PCB-contaminated soil would not be removed or treated. The action-specific ARARs would be met by this alternative.

* Note: The intent of Alternative 2B is to dispose of a portion of the PCB-contaminated soil at a Subtitle D facility to reduce the cap area. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

Implementability

The construction of a concrete cap would employ standard construction procedures with special precautions for health and safety. No specific difficulties are anticipated for the implementation of this alternative.

Cost

The detailed cost estimate for this alternative is presented in Appendix B. The estimated costs are presented below. The estimated costs for the remedial alternatives are also summarized in Table 5.2.

Capital	$ 562,000
Average Annual O&M	$ 2,000
Present Worth (30 yr., 10% Discount Rate)	$ 611,000

6.2.4 Alternative 3 – Excavation and On-Site Thermal Desorption

6.2.4.1 Description

Soils determined to contain PCB concentrations in excess of 10 mg/kg would be excavated. Since some areas to be excavated are transversed by railroad tracks, these tracks would be temporarily removed for the excavation of the subsurface and inter-rail soils.

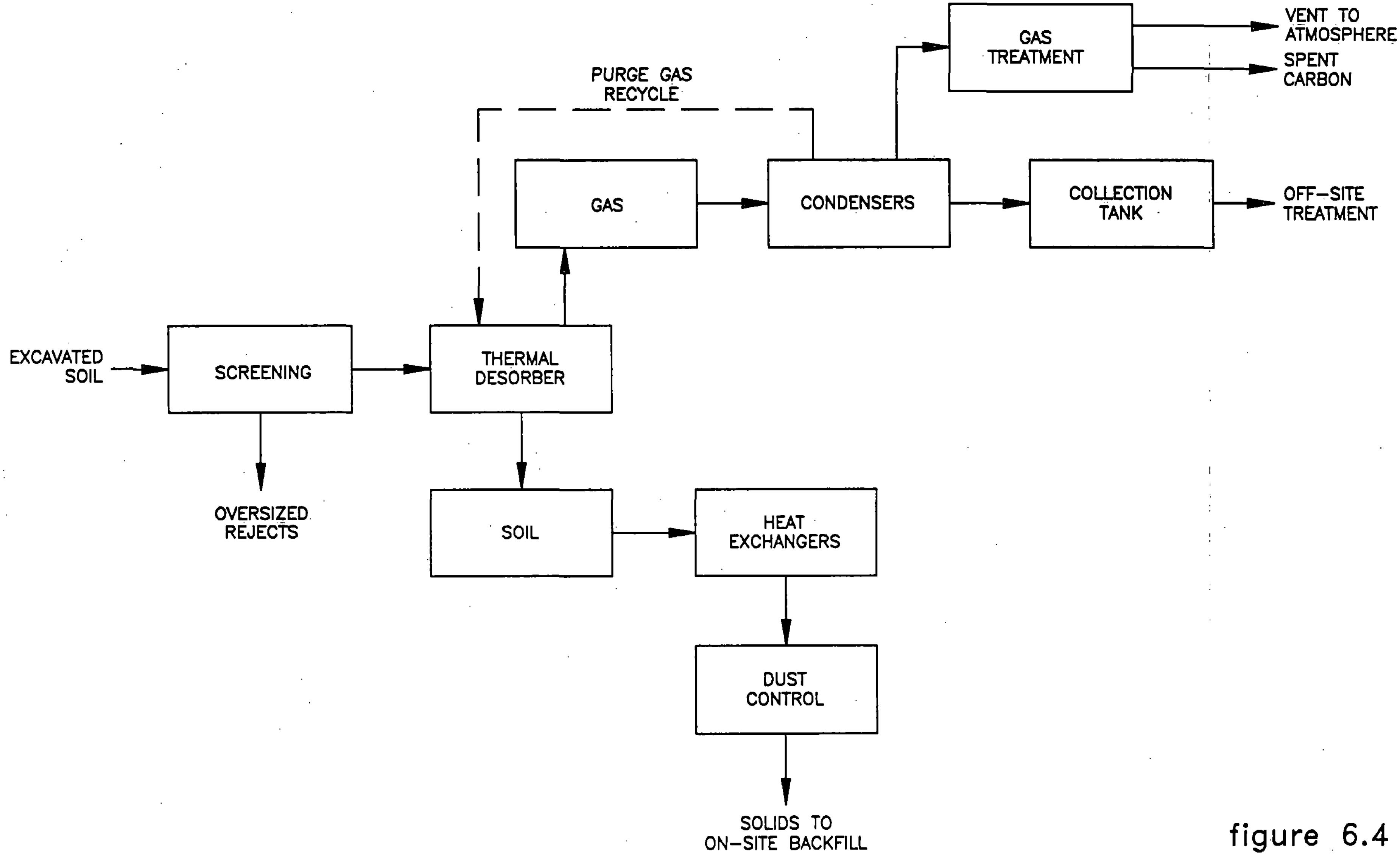

figure 6.4
ALTERNATIVE 3
EXCAVATION AND ON-SITE
THERMAL DESORPTION
IBS, Inc.–Peoria, Illinois

CRA

4310-6/11/92-M

6.2.4.2 Assessment

Overall Protection of Human Health and the Environment

The thermal desorption of the PCB-contaminated soil would reduce the overall risk by effectively removing the PCBs from the soil. The PCBs extracted from the soil would be collected during the thermal desorption process for further off-site treatment and/or disposal, and the processed soil would be backfilled on-site.

Compliance with ARARs

The excavation and thermal treatment of the contaminated soils would satisfy the location-, chemical- and action-specific ARARs identified within Section 3.

Long-Term Effectiveness and Permanence

The risks posed by the presence of PCBs in the soils at the present concentrations would be significantly reduced since the contaminated soils would be treated.

Reduction of Toxicity, Mobility or Volume Through Treatment

The excavation and thermal desorption of the soils contaminated with PCBs exhibiting concentrations greater than 10 mg/kg

Cost

The estimated costs are presented below. The detailed cost estimate for this alternative is presented in Appendix B. The estimated costs for the remedial alternatives are also summarized in Table 5.2.

Capital	$4,107,000
Average Annual O&M	$ -0-
Present Worth (30 yr., 10% Discount Rate)	$4,107,000

6.2.5 Alternative 4 – Excavation and Soil Washing

6.2.5.1 Description

Soils with PCB concentrations in excess of 10 mg/kg would be excavated. Since some areas to be excavated are transversed by railroad tracks, these tracks may be temporarily removed for the excavation of subsurface and inter-rail soils.

Excavated soils would be treated by soil washing to remove the PCBs from the soil particles. The soil washing process uses non-toxic solvents to wash the PCBs from the soil Excavated soil is first screened to remove large debris (greater than 3 inches) which are then either crushed and processed or disposed of separately. The soil is continuously washed with a solvent in a counter-current process. The PCBs are dissolved by the solvent and are extracted from the soil matrix. The soil washing process is a

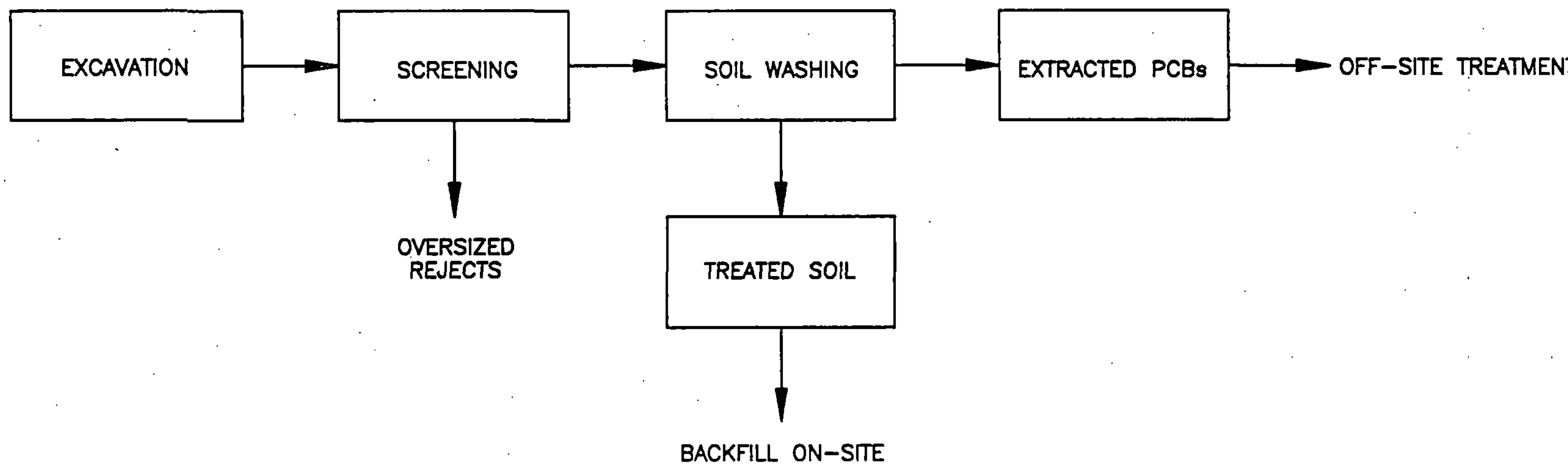

figure 6.5
ALTERNATIVE 4
EXCAVATION AND SOIL WASHING
IBS, Inc.–Peoria, Illinois

CRA
4310-6/11/92-M

Long-Term Effectiveness and Permanence

The risks posed by the presence of PCBs in the soils at the present concentrations would be significantly reduced since the contaminated soils would be extracted from the soil and removed off-site.

Reduction of Toxicity, Mobility or Volume Through Treatment

The excavation of the soils contaminated with PCBs exhibiting concentrations greater than 10 mg/kg would significantly reduce the toxicity, mobility and volume of the contaminated soils by treatment of soil.

Short-Term Effectiveness

Only minimal releases of fugitive dusts would occur during the excavation phase of this remedial alternative implementation. Fugitive dust releases during construction may be easily mitigated.

Local security in the form of temporary fencing around the treatment center would be provided to minimize exposure of Site workers and trespassers to the contaminated soils and the soil washing unit.

Implementability

An area would be established within the Site to allow for the placement of the mobile unit, stockpiles of excavated and treated soils and of at a TSCA-permitted landfill. The gravel fraction screened from the excavated soil would tested for PCBs. Soils exhibiting PCB concentrations less than 10 mg/kg would be backfilled into the previously excavated areas of the Site. Screened gravels and excavated soils exhibiting PCB concentrations between 10 mg/kg and 50 mg/kg* would be disposed of at a solid waste landfill.

Due to the lower disposal cost, screening would not be conducted on soils with PCB concentrations less than 50 mg/kg since it would not provide a significant cost reduction.

A schematic depicting the soil screening process is shown on Figure 6.6.

The distinct benefit of screening soils above 50 mg/kg is the reduction in volumes to be disposed of at a TSCA-permitted landfill. This reduction in soil volume would reduce the overall cost of this remedial alternative.

* Note: The intent of Alternative 5 is to dispose of a portion of the PCB-contaminated soil at a Subtitle D facility. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

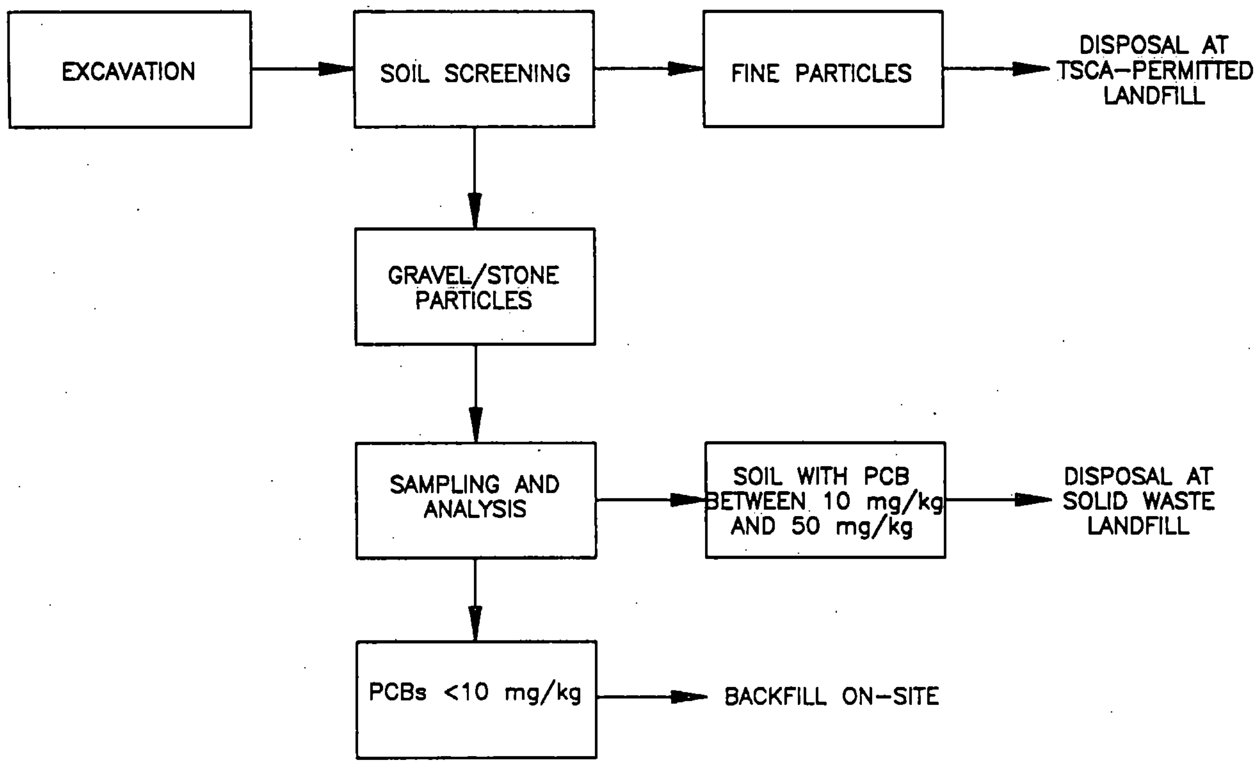

figure 6.6
ALTERNATIVE 5
EXCAVATION, SOIL SCREENING
AND OFF-SITE LANDFILLING
IBS, Inc.–Peoria, Illinois

CRA

4310-6/11/92-M

6.2.6.2 Assessment

Overall Protection of Human Health and the Environment

The excavation and off-site disposal of Site soils exhibiting PCB concentrations greater than 10 mg/kg would significantly reduce the Site risk since the PCBs would be removed off-site for disposal.

Compliance with ARARs

The excavation, soil screening and off-site landfilling of the contaminated soils would satisfy the location-, chemical- and action-specific ARARs identified within Section 3.

Long-Term Effectiveness and Permanence

The risks posed by the presence of PCBs in the soils at the present concentrations would be significantly reduced since the contaminated soils would be moved off-site to a managed disposal facility designed to accept such wastes.

Reduction of Toxicity, Mobility or Volume Through Treatment

Excavation of the soils contaminated with PCBs exhibiting concentrations greater than 10 mg/kg would significantly reduce the volume of the contaminated soils by effectively removing the PCBs from the Site. This alternative does not provide treatment of the soil, but is effective at

Capital	$1,494,000
Average Annual O&M	$ -0-
Present Worth (30 yr., 10% Discount Rate)	$1,494,000

6.3 COMPARISON OF ALTERNATIVES

Each of the six proposed remedial alternatives discussed within the preceding section are compared to each other based on the evaluation criteria.

6.3.1 Overall Protection of Human Health and the Environment

Alternative 1 (No Action) does not mitigate the Site risks since no remedial effort would be implemented.

Alternative 2A (Concrete Cap and Deed Restrictions) would provide protection through containment of the PCB-contaminated soil by isolating the soil from direct exposure to Site workers and the general public.

Alternative 2B (Excavation, Concrete Cap and Deed Restrictions) would provide excavation and off-site disposal of soils

Compliance with location-specific ARARs would be achieved with Alternatives 2A, 2B, 3, 4 and 5. Alternative 1 would not achieve location-specific ARAR compliance since the contaminated soil would be susceptible to flood erosion.

Compliance with action-specific ARARs would be achieved by all six alternatives.

6.3.3 Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness and permanence since no remedial actions would be implemented. The long-term residual risk would be greatest for this alternative, as compared to the other four alternatives.

Alternatives 2A and 2B would provide long-term effectiveness and permanence since the PCBs would be contained.

Alternatives 3, 4 and 5 would provide long-term effectiveness and permanence since the PCBs would be removed from the Site to either be treated or disposed. These alternatives are more permanent than Alternatives 2A or 2B since both long-term maintenance and effective deed restrictions are required to ensure an effective remedy under Alternatives 2A and 2B.

Minimal releases of fugitive dusts may occur during the excavation phase of Alternatives 2B, 3, 4 and 5. These releases would be controlled using dust control measures.

6.3.6 Implementability

Implementability is not applicable with Alternative 1 since remedial actions would not be implemented.

Alternative 3 (Thermal Desorption) is considered the most complex alternative to implement due to permitting and community acceptance issues.

Alternative 4 (Soil Washing) may have implementation difficulties since it involves development of a slurry, generation of wastewater, soil dewatering and on-site backfilling.

6.3.7 Cost

The estimated costs for implementation of each of the five remedial alternatives range from no cost for Alternative 1 to $4,107,000 for Alternative 3. The costs for each of the six alternatives are summarized on Table 5.2.

7.0 RECOMMENDATIONS

Based on the review of remedial alternatives, three alternatives are considered practical. All three will achieve similar effectiveness, but at substantially different costs. In order of preference, these are:

Alternative 2B - Excavation, Concrete Cap and Deed Restrictions

This alternative would effectively reduce the exposure risk associated with the contaminated soil by removing the soils with PCB concentrations between 10 mg/kg and 50 mg/kg* for off-site disposal and capping those soils with PCB concentrations greater than 50 mg/kg*. This alternative has a substantially lower capital cost than Alternatives 2A and 5. This is, therefore, the remedy recommended by CRA.

Alternative 2A - Concrete Cap and Deed Restrictions

This alternative would effectively reduce the exposure risk associated with the contaminated soil through isolation of the contaminated soil from dermal contact. This alternative would have a higher capital cost than Alternative 2B and the effectiveness of the two alternatives would be similar.

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* Note: The intent of Alternative 2B is to dispose of a portion of the PCB-contaminated soil at a Subtitle D facility to reduce the cap area. Some Subtitle D landfills establish a cut-off acceptance PCB concentration of less than 50 mg/kg. In this case, the remedial alternative would be modified slightly to match the PCB concentration cut-off level of the receiving facility.

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS AND ASSOCIATES

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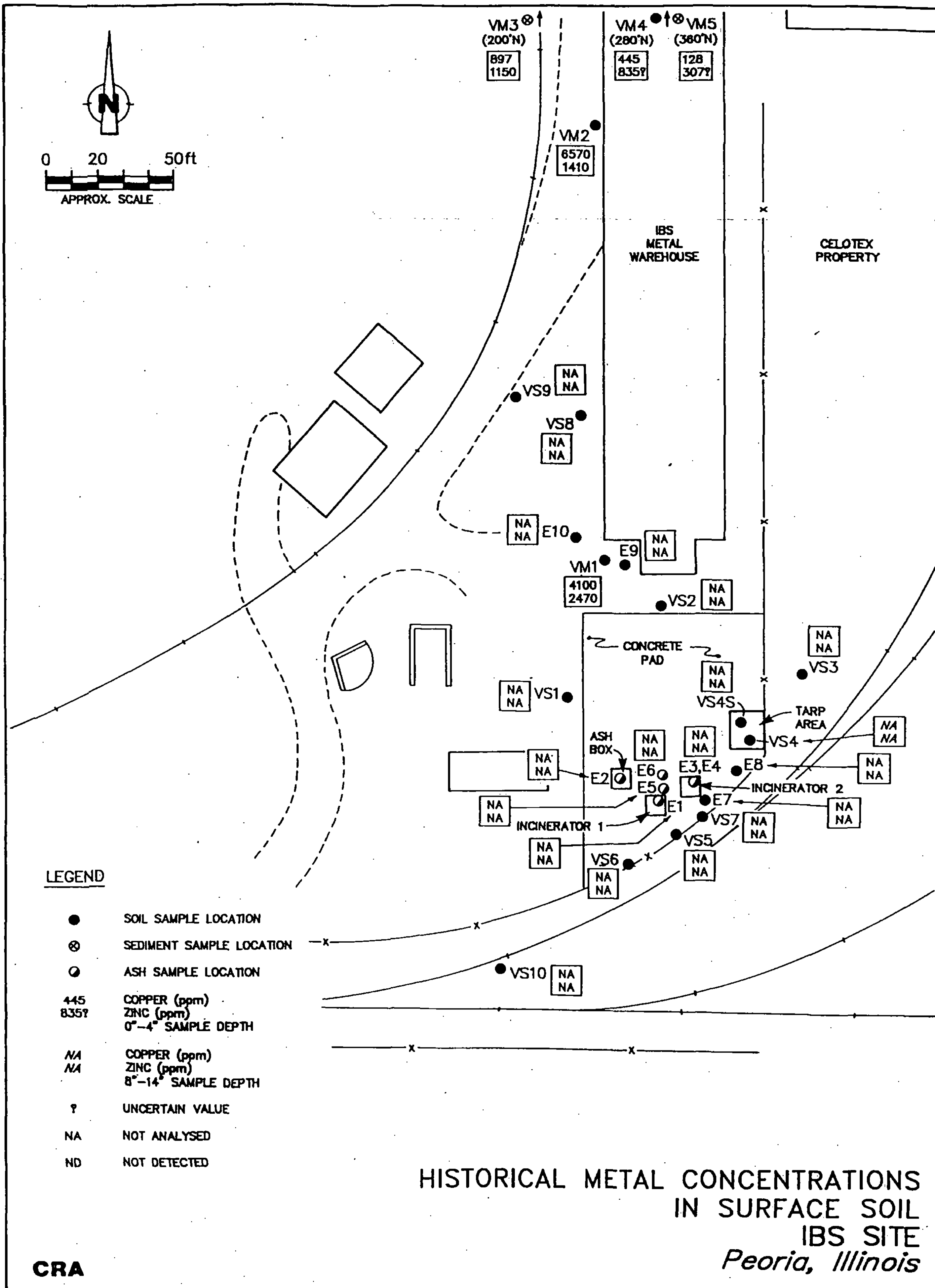
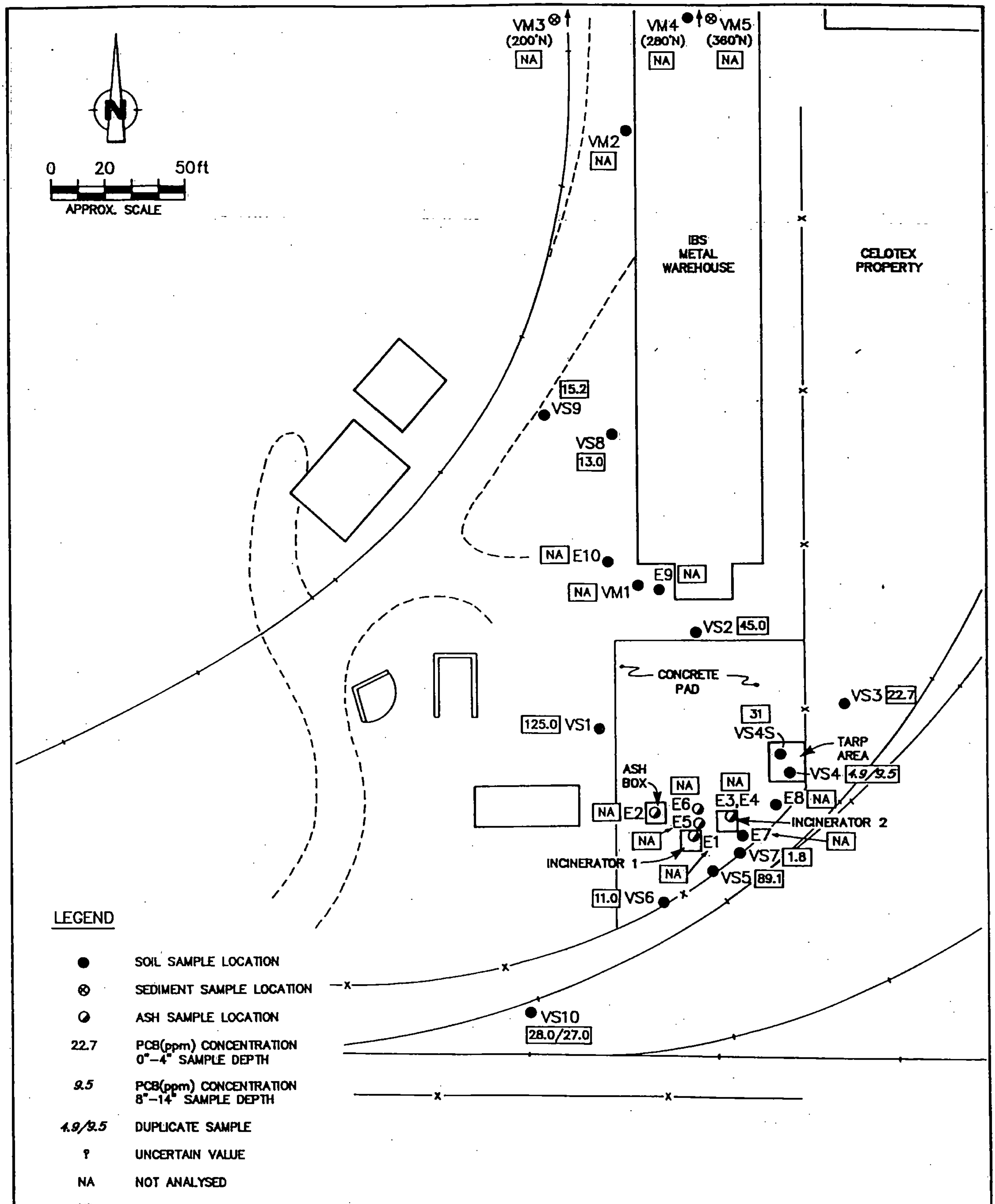
APPENDIX A

HISTORICAL PCB, DIOXIN, COPPER AND ZINC SOIL SAMPLING RESULTS



HISTORICAL METAL CONCENTRATIONS
IN SURFACE SOIL
IBS SITE
Peoria, Illinois

4310-6/11/92-M



HISTORICAL TOTAL PCB CONCENTRATIONS
IN SURFACE SOIL
IBS SITE
Peoria, Illinois

CRA

4310-6/11/92-M

APPENDIX B

POTENTIAL REMEDIAL ALTERNATIVES - DETAILED COST SHEETS

TABLE B-1

Fencing and Deed Restrictions

Remedial Activity	Quantity	Unit	Unit Cost	Capital Cost	Annual Cost
Remedial Work Plan/Remedial Design	1	LS	$30,000	$30,000	
Fencing w/Gates	1000	LF	$20	$20,000	$1,000
Administrative (Deed Restrictions)	1	LS	$20,000	$20,000	
Construction Report	1	EA	$7,500	$7,500	
SUBTOTAL - Capital Costs				<u>$77,500</u>	
SUBTOTAL - O&M Costs					<u>$1,000</u>
Engineering	25%			$19,375	
Health & Safety	5%			$3,875	
Contingency	20%			$15,500	
TOTAL CAPITAL COST				**$116,000**	
TOTAL ANNUAL COST					**$1,000**
TOTAL PRESENT WORTH (30 years, 10% discount rate)				**$125,000**	

NOTE: Total costs are rounded off to the nearest $1000.

TABLE B-3

ALTERNATIVE 2B
Excavation, Concrete Cap and Deed Restrictions

Remedial Activity	Quantity	Unit	Unit Cost	Capital Cost	Annual Cost
Remedial Work Plan/Remedial Design	1	LS	$60,000	$60,000	
Pre-Capping Sampling	150	EA	$250	$37,500	
Site Preparation and Grading	1	LS	$5,000	$5,000	
Excavate Soils (10 ppm<PCBs<50 ppm)	1	LS	$5,000	$5,000	
Post-Excavation Sampling	100	EA	$250	$25,000	
Soil Disposal (10 ppm<PCBs<50 ppm)	3150	TON	$13	$40,950	
Granular Base (6" depth)	750	CY	$10	$7,500	
Concrete (8" depth)	1000	CY	$150	$150,000	$2,000
Granular Backfill	3150	TON	$10	$31,500	
Administrative (Deed Restrictions)	1	LS	$20,000	$20,000	
Construction Report	1	EA	$12,000	$12,000	
SUBTOTAL - Capital Costs				$394,450	
SUBTOTAL - O&M Costs					$2,000
Engineering	25%			$98,613	
Health & Safety	5%			$19,723	
Contingency	20%			$78,890	
TOTAL CAPITAL COST				**$592,000**	
TOTAL ANNUAL COST					**$2,000**
TOTAL PRESENT WORTH (30 years, 10% discount rate)				**$611,000**	

NOTE: Total costs are rounded off to the nearest $1000.

TABLE B-5

Off-Site Incineration

Remedial Activity	Quantity	Unit	Unit Cost	Capital Cost	Annual Cost
Remedial Work Plan/Remedial Design	1	LS	$60,000	$60,000	
Pre-Excavation Sampling	150	EA	$250	$37,500	
Bench Scale Testing	1	EA	$25,000	$25,000	
RR Track Removal and Replacement	1	LS	$50,000	$50,000	
Excavate Soils	3700	CY	$7	$25,900	
Post-Excavation Sampling	100	EA	$250	$25,000	
Mobilization/Demobilization/Permiting	1	LS	$500,000	$500,000	
Pre-Treatment Sampling	100	EA	$250	$25,000	
Transportation to Off-Site Location	5550	TON	$75	$416,250	
Rotary Kiln Incineration	5550	TON	$500	$2,775,000	
Post-Treatment Sampling	100	EA	$250	$25,000	
Off-Site Disposal of Treated Soil	5550	TON	$13	$72,150	
Granular Backfill	5550	TON	$10	$55,500	
Construction Report	1	EA	$50,000	$50,000	
SUBTOTAL - Capital Costs				$4,142,300	
SUBTOTAL - O&M Costs					$0
Engineering	15%			$621,345	
Health & Safety	5%			$207,115	
Contingency	20%			$828,460	
TOTAL CAPITAL COST				**$5,799,000**	
TOTAL ANNUAL COST					**$0**
TOTAL PRESENT WORTH (30 years, 10% discount rate)				**$5,799,000**	

NOTE: Total costs are round off to the nearest $1000.

TABLE B-7

Excavation and Off-Site Thermal Desorption

Remedial Activity	Quantity	Unit	Unit Cost	Capital Cost	Annual Cost
Remedial Work Plan/Remedial Design	1	LS	$60,000	$60,000	
Pre-Excavation Sampling	150	EA	$250	$37,500	
Bench Scale Testing	1	EA	$15,000	$15,000	
RR Track Removal and Replacement	1	LS	$50,000	$50,000	
Excavate Soils	3700	CY	$7	$25,900	
Post-Excavation Sampling	100	EA	$250	$25,000	
Mobilization/Demobilization/Permitting	1	LS	$250,000	$250,000	
Pre-Treatment Sampling	100	EA	$250	$25,000	
Transportation to Off-Site Location	5550	TON	$75	$416,250	
Thermal Desorption Treatment	5550	TON	$375	$2,081,250	
Post-Treatment Soil Sampling	100	EA	$250	$25,000	
Off-Site Disposal of Treated Soil	5550	TON	$13	$72,150	
Granular Backfill	3700	CY	$10	$37,000	
Construction Report	1	EA	$50,000	$50,000	
SUBTOTAL - Capital Costs				$3,170,050	
SUBTOTAL - O&M Costs					$0
Engineering	15%			$475,508	
Health & Safety	5%			$158,503	
Contingency	20%			$634,010	
TOTAL CAPITAL COST				**$4,438,000**	
TOTAL ANNUAL COST					**$0**
TOTAL PRESENT WORTH (30 years, 10% discount rate)				**$4,438,000**	

NOTE: Total costs are rounded off to the nearest $1000.

TABLE B-9

ALTERNATIVE 4
Excavation and Soil Washing

Remedial Activity	Quantity	Unit	Unit Cost	Capital Cost	Annual Cost
Remedial Work Plan/Remedial Design	1	LS	$60,000	$60,000	
Pre-Excavation Sampling	150	EA	$250	$37,500	
RR Track Removal and Replacement	1	LS	$50,000	$50,000	
Excavate Soils	3700	CY	$7	$25,900	
Post-Excavation Sampling	100	EA	$250	$25,000	
Mobilization/Demobilization	1	LS	$100,000	$100,000	
Soil Washing and Liquids Treatment	5550	TON	$165	$915,750	
Post-Washing Sampling	100	EA	$250	$25,000	
Backfill Treated Soil	5550	TON	$7	$38,850	
Construction Report	1	EA	$30,000	$30,000	
SUBTOTAL - Capital Costs				$1,308,000	
SUBTOTAL - O&M Costs					$0
Engineering	25%			$327,000	
Health & Safety	5%			$65,400	
Contingency	20%			$261,600	
TOTAL CAPITAL COST				**$1,962,000**	
TOTAL ANNUAL COST					**$0**
TOTAL PRESENT WORTH (30 years, 10% discount rate)				**$1,962,000**	

NOTE: Total costs are rounded off to the nearest $1000.